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MONTANA

Vol. 6, No 1
June 1931

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THE HAPPY HALF MILLION

Montana's population, a little over one half million souls, living in a spacious realm of 93,000,000 acres of prairie, foot-hill, mountain and valley lands are not only happy in their huge per capita share of the great out-doors, but, despite the ups and downs of the great world outside and the backwash upon Montana's industries and institutions, the happy half million are recording a progress along all lines that fulfills the hopes to which their predecessors, the pioneers, dedicated their lives and fortunes. The following 10-year record of progress of Montana has been prepared by the Montana state division of publicity for the anniversary number of the Farm Review.

A DECADE OF MONTANA DEVELOPMENT AT A GLANCE

	1920	1930
AGRICULTURAL:		
Number of acres in farms (acres)	35,070,000	44,122,285
Average size of farm (acres)	608.1	929.0
Number of farms 1,000 acres or over	5,622	10,497
Value of farm equipment	$55,004,212	$62,377,124
Acres of farms operated by owners	28,952,950	34,633,442
Numbers of livestock:		
Milk cows	178,000	188,000
Sheep	2,450,000	4,326,000
Chickens	2,055,120	2,118,717
Acres of:		
Wheat	1,698,531	4,415,961
Hay	1,608,836	2,077,160
Flaxseed	128,851	362,251
Barley	29,330	243,873
Sugar beets	8,600	45,000
Shipments:		
Wheat	29,843,000	78,257,000*
Cattle	211,000	294,509
Sheep	913,000	1,966,000
INDUSTRIAL:		
Total new wealth produced	$353,574,000	$365,447,000†
Value of manufactures	$33,059,000	$65,000 000†
Total gainful workers including agricultural	214,183	216,471
Gainful workers mfg. and mech.	20,692	26,982
TRANSPORTATION FACILITIES:		
Miles of railroads	7,200	7,444
Miles of improved highways	590	2,570
EDUCATIONAL:		
Enrollment in public schools	118,000§	120,337
Enrollment in State University, Missoula	1,296	2,347
Enrollment in Agricultural College	1,255	1,570
Enrollment in state normal schools	551	672‡
FINANCIAL AND GOVERNMENTAL:		
Total resources state and private banks	$68,770,674	$77,672,418
Taxable values:		
Land per acre, cts.	19.3	14.2
Cattle per head, cts.	87.1	69.5
Sheep per head, cts.	18.6	14.3
**TOTAL PUBLIC DEBT	$57,244,984	$41,697,155

*1927 wheat shipments.
†1928 estimate.
§Estimate, 1920 records not entirely comparable with 1930.
‡Does not include northern Montana.
**Years compared are 1923 and 1930.
Source of agricultural data, United States department of agriculture and census bureau.

MONTANA

1930 FARM REVIEW EDITION

By

The State-Federal Crop Reporting Service
JAY G. DIAMOND, Agricultural Statistician
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U. S. Bureau of Agricultural Economics

N. A. OLSEN, Chief

Co-operating with the Department of

Agriculture, Labor and Industry

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Chief, Publicity Division

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FOREWORD

AN ANNIVERSARY EDITION

The year 1931 will mark the tenth anniversary of the Montana state-federal crop reporting service. In June, 1921, the Montana office of the U. S. Bureau of Crop Estimates and the Montana State Department of Agriculture, with the Extension Service of the Montana Agricultural College entered into a cooperative agreement to conduct the crop reporting work in Montana under one office to be known as the state-federal crop reporting service.

Since that time Montana's agriculture has staged a tremendous development and taken a place among the important states of the nation, and it has been the responsibility of the state-federal crop reporting service to record this development as it has transpired year by year. Much of this record has been written into the annual issues of this bulletin, the first of which was compiled by George Scott, federal agricultural statistician, and Charles D. Greenfield, Jr., who at that time was chief of the State Division of Publicity. Volume I reviewed the early history of Montana's agriculture in addition to presenting the statistics of the years 1919 to 1922.

The changes in crop and livestock production in Montana which have occurred since the first volume of this review was written have been cumulative and present some striking contrasts when considered in the light of 10 years ago. Some of the more significant shifts of agriculture in Montana will be presented in this anniversary issue, utilizing for this purpose the detailed information now available in the 1930 census as compared with the census of 1920.

WARREN W. MOSES, *Chief*
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A. H. STAFFORD, *Commissioner,*
Department of Agriculture,
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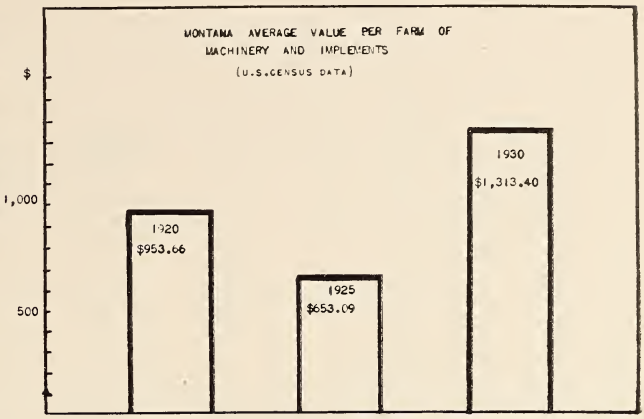
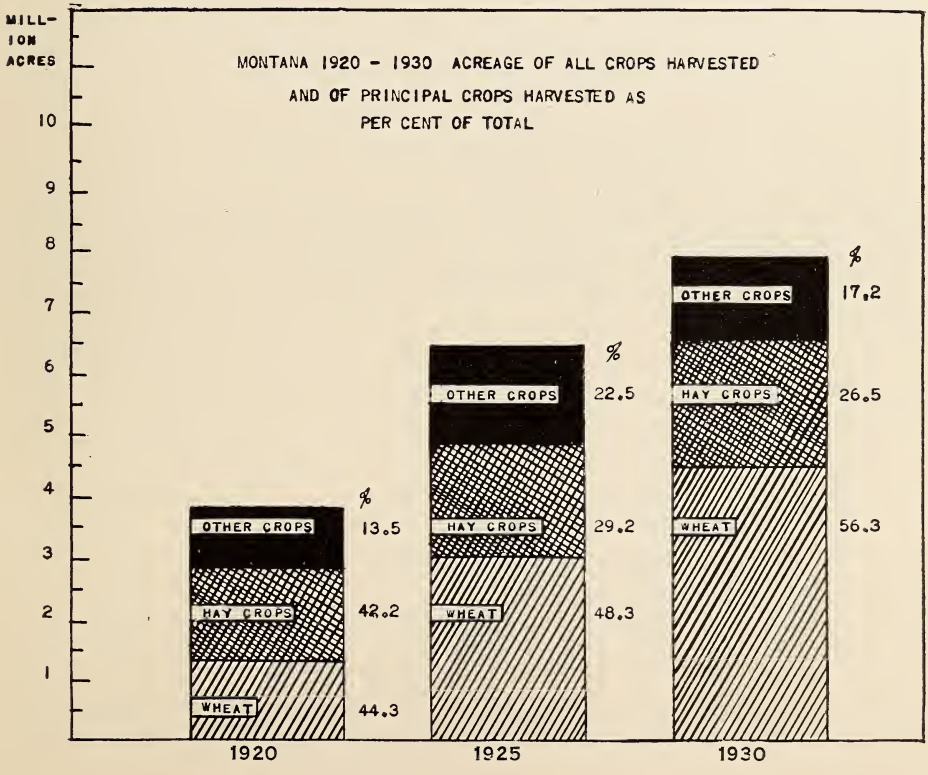
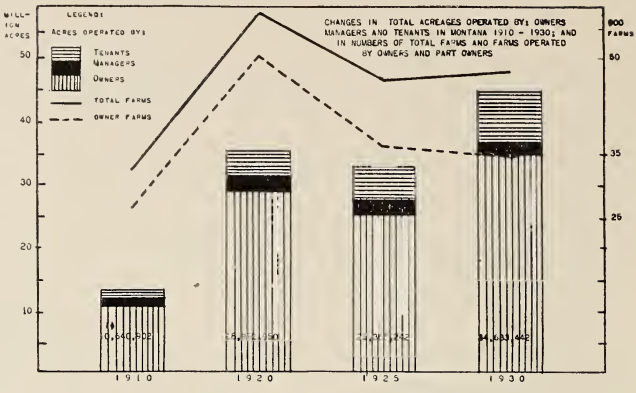
TEN YEARS OF AGRICULTURAL CHANGES

Ten years ago Montana's farms numbered 57,677 and contained a total farm acreage of 35,070,000, or an average of 608.1 acres per farm. Today 47,493 farmers are operating a total acreage of 44,122,285, an average of 929 acres per farm. The average Montana farm 10 years ago was worth at prevailing prices $13,468, an average value of $22.15 per acre. Today that farm with 52.8 per cent more land within its borders is priced at but $11,074, or at a rate of $11.92 per acre. In other words a dollar invested in Montana lands today goes almost twice as far as that same dollar in 1920. That the 1920 value per acre was not unduly high at that time is indicated by a comparison with the 1910 average which was $18.58 per acre.





ACREAGE SHIFTS IN THE PAST 10 YEARS

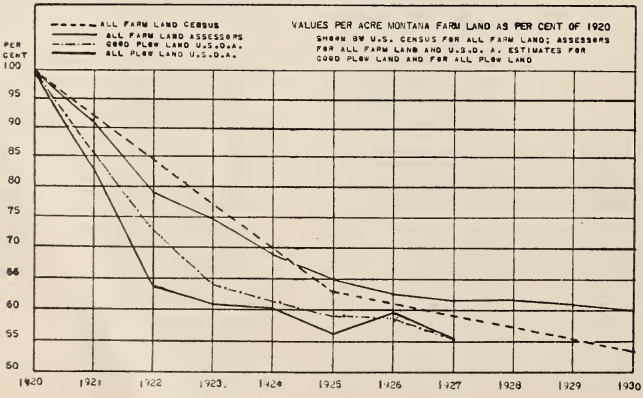


In the general expansion of total farm acreage during the past decade, wheat has increased its proportion in the total harvested acreage from 44.3 per cent in 1920 to 56.3 per cent in 1930. Hay acreage, while larger than 10 years ago, represented in 1930 but 26.5 per cent of the total harvested acreage of all crops where in 1920 it amounted to 42.2 per cent of the total. Crops other than wheat and hay not only made significant gains since 1920 but increased their proportion of total harvested acreage from 13.5 per cent in 1920 to 17.2 per cent in 1930.

Here we have the picture of the Montana wheat farmer using a larger farm of lower acre value than he used a decade ago. In this set-up there is another factor, that of implement and machinery equipment. The 1930 farm shows an average value of implements and machinery of $1,313.40; in 1925 this item was $653.09, while in 1920 it was $953.66 per farm. These figures index the degree to which Montana grain farms have been mechanized, especially in the past five years, but they do not reflect the real increase in inventory numbers of such equipment between 1920 and 1930 because of the relatively high prices of farm machinery and implements at the beginning of the decade compared with the end. Some idea of the allowance to be made for this factor is afforded by a comparison of the index numbers of wholesale prices of metal and metal products which was 130.9 per cent in 1919, compared with 104.4 per cent in 1929.

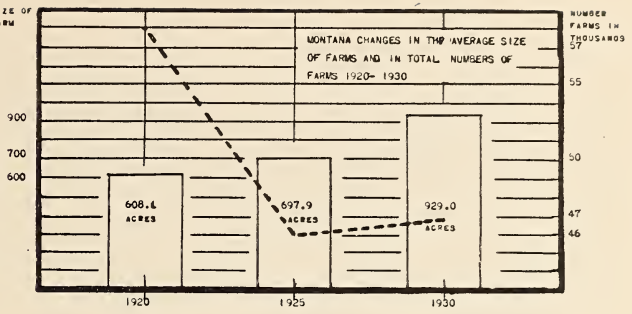
THE LOWER FARM INVESTMENT

This decrease in average land value in Montana is perhaps the most significant of the changes of the past 10 years. Upon it are predicated both the increased size of the average farm now operating and the expansion of the state's principal cash crop, that of wheat. It denotes one of the important adjustments Montana farmers have made in the past decade, that of reducing the cost of production as represented by the cost of the use of land on which crops are grown. From an investment standpoint it of course signifies a loss for the depreciation it implies for farms purchased before 1920, but from the standpoint of the operating farmer today it represents a lower fixed charge on his production.



The lower land values compared with 10 years ago are not due to an admixture of poor lands with good lands, but represent a general decline of all classes of farm lands. To illustrate, the March 1 estimates of land values of the U. S. Department of Agriculture show under

a classification of good plow lands an estimated 1920 value per acre of $48. In 1927, the last year in which this particular classification was made, the average reported value was $26.50 per acre. For all plow lands for which the series is complete the 1920 value of $36 per acre had dropped to $21 per acre in 1931.

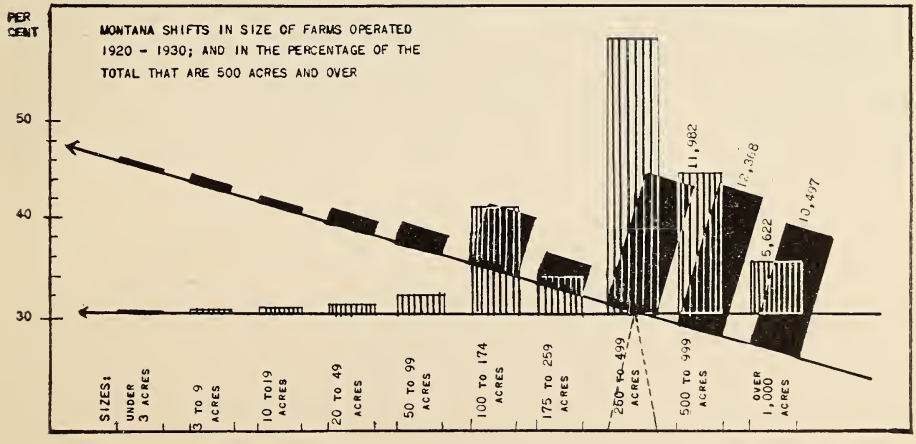


THE INCREASED SIZE OF FARM

The increased size of the average farm in Montana in the past decade does not mean that the small farm has disappeared. The number of farms under 100 acres in class sizes down to three acres as a group increased 20.6 per cent. Farms of a size between 100 acres and 499 acres decreased 45.4 per cent; farms of a size between 500 and 999 acres increased 3.2 per cent and the number of farms over 1,000 acres more than doubled with an increase of 113.1 per cent. In other words the past 10 years has marked the passing of many of the old conventional type grain farms of 160, 320 and 480 acre size, these farms enlarging into the larger sizes, many of them as indicated going into the group of 1,000 acres and larger.

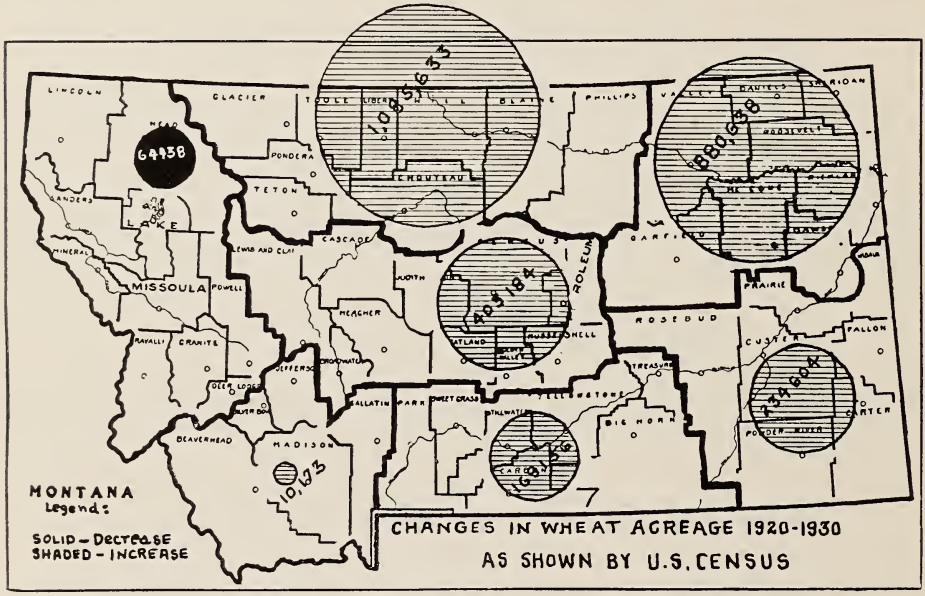
THE SHIFTS IN WHEAT ACREAGE

In 1920 a total wheat acreage of 1,691,531 was reported by the census as being harvested in 1919, while the 1930 census reported 4,415,961 acres harvested in the year 1929. Both years were years of drouth and acreage abandonment when considerable of the planted acreage was not harvested. The year 1919 was characterized by much heavier acreage abandonment than 1929 so that the large increase shown for the 10 year period is somewhat exaggerated, compared with the picture that would have been presented had both years been average seasons. However the wheat acreage increase in Montana in the past decade has been material. Between 1925 and 1930 the census data is more representative and shows an increase from 3,102,879 acres harvested in 1924 to 4,415,961 acres harvested in 1929. In the analysis of the shifts in wheat acreage by districts and counties during the past 10 years the census data is used. In the district shifts, the data is also shown for the two periods of 1920 to 1925, and 1925 to 1930.



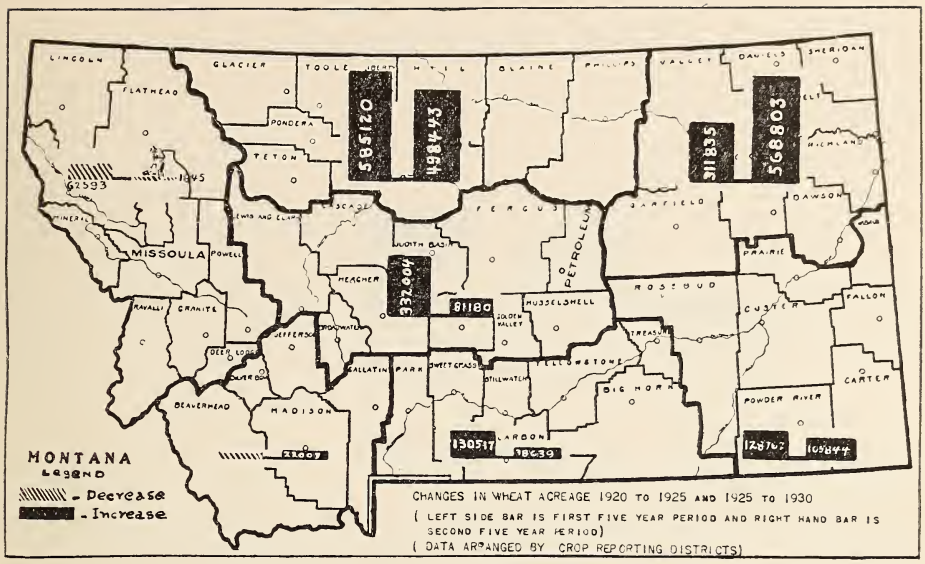
WHEAT ACREAGE SHIFTS BY DISTRICTS

Map 1 shows the seven crop reporting districts of Montana and the changes in wheat acreage as reported by the two census enumerations covering the period 1920 to 1930. This data shows the largest increase in wheat acreage for the decade occurring in north-central Montana with a similar, though somewhat smaller, expansion in northeastern Montana. Central, southeastern and southcentral Montana show relatively smaller increases in the order as named. In western Montana, north of the Continental Divide, the wheat area decreased and only a small increase was shown for southwestern Montana. In a general way the expansion of wheat acreage tends to reflect the growth of large scale wheat farming in Montana as it has developed in the past decade. In western Montana the decrease in wheat acreage has apparently gone hand in hand with the development of dairy farming and specialized crops in that area in the past 10 years.



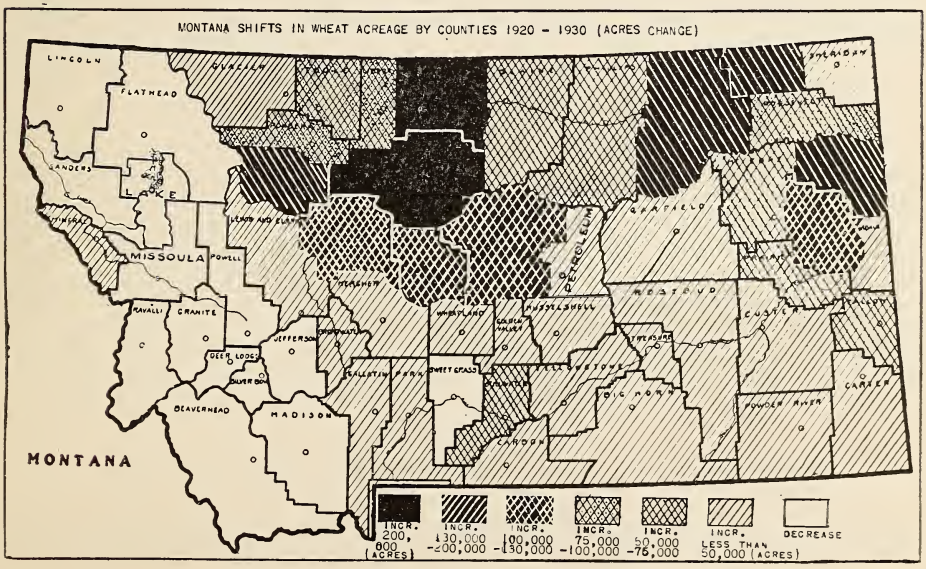
WHEAT SHIFTS BY FIVE-YEAR PERIODS

Map 2 shows the wheat shifts by districts for the two five-year periods of the past decade. This eliminates the year of 1919 and its uncertainties of acreage due to drouth and shows the increases for the period 1925 to 1930. During this period the increased acreage has largely been confined to northeastern and north-central Montana with southeastern Montana showing a greater increase than either of the older central and southcentral wheat areas. The decrease in western Montana during the past five years is shown to be at a slower rate than during the first five years.

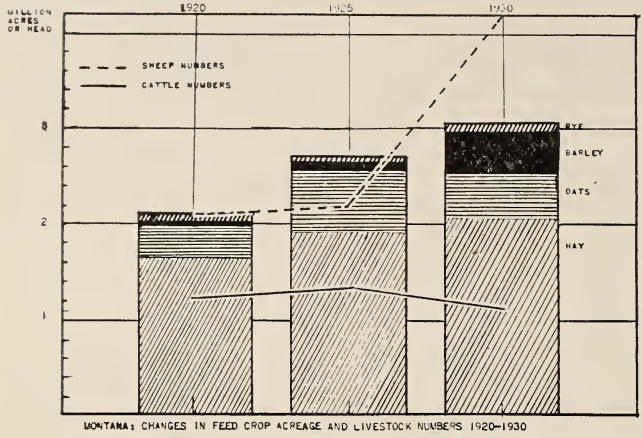

MONTANA
LEGEND
- Decrease
- Increase
CHANGES IN WHEAT ACREAGE 1920 TO 1925 AND 1925 TO 1930
(LEFT SIDE BAR IS FIRST FIVE YEAR PERIOD AND RIGHT HAND BAR IS SECOND FIVE YEAR PERIOD)
(DATA ARRANGED BY CROP REPORTING DISTRICTS)

WHEAT SHIFTS BY COUNTIES

Map 3 shows Montana's wheat shifts by counties for the 10 years, 1920 to 1930. Barring the uncertainties of such a comparison due to the 1919 abandonment the areas of substantial increase are shown to be limited largely to seven central and northcentral counties and four northeastern counties, all but one of the counties of western Montana showing a decreased wheat acreage.



SHIFTS IN FEED CROP ACREAGE AND LIVESTOCK NUMBERS



MONTANA: CHANGES IN FEED CROP ACREAGE AND LIVESTOCK NUMBERS 1920-1930

Along with the expansion of wheat acreage in the past decade, the combined acreage of feed crops of rye, barley, oats and hay in Montana has increased from a little more than 2,000,000 acres in 1920 to 2,700,000 in 1925 and about 3,100,000 in 1930. Of these crops hay acreage alone increased about 30 per cent. Barley acreage increased tremendously from about 29,000 acres in 1920 to about 244,000 acres in 1930. The increase in barley acreage was largely due to the substitution of barley for oats acreage particularly in the past five years when oats acreage has materially declined. Rye acreage for the 10-year period shows a decline of about 12 per cent.

As related to changes in livestock numbers this increase in feed crop acreage has been accompanied by increases in both cattle and sheep numbers in the first five years' period and substantial increases in sheep numbers in the second half of the decade and a slight decline in numbers of all cattle. Milk cows, however, show an increase of about 20 per cent for the 10-year period. For other livestock the principal trends have been a sharp decline in horse numbers, a slight increase in total numbers of poultry and a moderate decline in hog numbers.

The total area in pasture land for the period 1925-1930 for which comparable data is available shows about 23,000,000 acres in 1925 against 31,000,000 in 1930. The items making up this crop include plowable pasture, woodland, and other pasture which is mostly grazing land. It is this item which shows the bulk of the increase for the period of the past five years when it has increased from a little over 17,000,000 acres in 1925 to about 24,000,000 acres in 1930.

SHIFTS IN ACREAGE OF SPECIAL CROPS

During the past 10 years Montana has developed such new cash crops as sugar beets, commercial potatoes, alfalfa and clover seed, beans, seed and canning peas, strawberries and commercial truck crops. While most of these crops were produced in a small way 10 years ago the aggregate value of production was very small. Then census enumeration for all these crops is not yet completed but some idea of their development may be gained from the estimates of their value in 1929 when the total was placed at about $5,761,000, or more than the wheat crop value for the state in 1910. Similarly in case of livestock, the value of dairy products, which was placed by the 1920 census at close to $7,500,000, was indicated to have reached almost $12,000,000 by the estimates of the State Dairy Division 10 years later. Substantial increases are likewise expected to be shown in the last census for such items as turkey sales and sales of honey and wax.

SIGNIFICANCE OF SHIFTS OF THE PAST DECADE

In interpreting the agricultural shifts of the past 10 years in Montana it is important to remember the fact that for the state as a whole agriculture is now more diversified than it was 10 years ago. By this conclusion is had in mind the

fact that although wheat acreage has expanded and returns from wheat as a cash crop have been increasing, the proportion of contribution made by wheat to total value of crops has been at a slower rate than the increase in production. Comparative data for values have not yet been issued by the census bureau although we have the estimates of the state-federal crop reporting service which show the following:

ESTIMATED VALUES

	1919	1929
Wheat	$25,029,000	$38,741,000
All other crops	39,902,000	55,326,000
All crops	$65,111,000	$94,067,000

Similarly in the estimated value of livestock production we find that while cattle and sheep continue to be the leading sources of livestock income by a wide margin there has been a significant increase in the income from other livestock items.

CORPORATION TAX PROCEEDS INCREASE

Although principally an agricultural state at the present time, Montana's infant industrial enterprises are growing steadily and point to the time when a large share of the tax burden now being carried by agriculture may ultimately be relieved by the growth of corporation taxes. The proceeds from such taxes during the past 10 years have more than doubled, despite some decrease in the numbers of corporations licensed in the state.

In 1921 the total amount of the corporation license tax was $196,758.37 with 839 corporations assessed in the state. In 1925 the amount of the tax had increased to $239,099.18 while the number of assessments fell to 664 and in 1930 the tax was considerably over the 1921 amount, being $437,908.29 on 1,166 assessed corporations.

INCREASE IN RAIL MILEAGE

Of importance to agriculture in Montana has been the increase in rail mileage in the state since 1921. With seven railroads operating in the state, three roads show a decrease in track mileage while the remaining four show an increase that far exceeds the decrease. In 1921 there were approximately 7,200 miles of all track being operated in the state while in 1930 the total amounted roughly to 7,444 miles or an increase of slightly less than 250 miles. This increase, in practically all instances, occurred in main track mileage, which track in 1921 amounted to about 5,108 miles, increasing by 1930 to approximately 5,275 miles.

THE DECADE IN IMPROVED HIGHWAYS

Roads and highways are important to agriculture as one of the means of communication which have brought the farm closer to the cities. Ten years ago the mileage of improved roads within Montana totaled only 590 miles. At the end of the decade this mileage had more than quadrupled to reach a total of 2,570 miles with the whole difference built under the supervision of the State Highway Commission.

Considerable construction of highways is contemplated by the State Highway Commission for Montana in the near future. Ultimately the 93,000,000 acres of farm, grazing, timber and recreational lands in Montana will be readily accessible not only to people within the state but also to the sojourner from the outside, whether he be looking for a new farm, a new home or a new vacation spot.

TREND OF AGRICULTURAL TAXATION IN MONTANA 1921 TO 1930

	1921	1925	1930
Average levy, livestock	52.75	53.27	57.31
Average levy, other	49.75	50.27	53.51
FARM AND GRAZING LAND			
Acres assessed	46,155,687	50,388,392	52,025,714
Value	$621,200,394	$483,377,900	$461,941,865
Taxable value (30%)	186,360,118	145,013,370	138,582,560
Estimated tax	9,271,416	7,289,822	7,387,836
Tax per acre (cents)	19.9	14.5	14.2
Improvements on farm and grazing land	$ 89,824,462	$ 57,555,707	$ 56,964,576
Taxable value (30%)	26,947,338	17,266,712	17,089,373
Estimated tax	1,340,630	867,998	911,034
Farm equipment	16,823,261	8,976,137	24,021,568
Taxable value (20%)	3,364,652	1,795,227	4,804,314
Estimated tax	167,391	90,246	256,118
LIVESTOCK (33⅓%)			
Horses			
Number assessed	523,895	465,457	362,661
Value	$ 24,920,690	$ 12,257,570	$ 8,573,329
Taxable value	8,298,590	4,081,771	2,854,919
Estimated tax	437,751	217,436	163,615
Tax per head (cents)	83.6	46.7	45.1
Cattle			
Number assessed	983,904	1,083,544	988,757
Value	$ 40,584,849	$ 27,136,257	$ 35,966,363
Taxable value	13,514,755	9,036,370	11,976,799
Estimated tax	712,903	481,367	686,390
Tax per head (cents)	72.5	44.5	69.5
Sheep			
Number assessed	1,717,114	1,953,771	3,256,347
Value	$ 10,342,050	$ 15,720,182	$ 24,336,184
Taxable value	3,443,903	5,234,821	8,103,949
Estimated tax	181,666	278,859	464,437
Tax per head (cents)	10.6	14.3	14.3
Other livestock (includes swine)			
Value	$ 469,880	$ 1,112,807	$ 1,349,202
Taxable value	156,470	370,565	449,734
Estimated tax	8,254	19,740	25,774

CROP PRODUCTION 1930 AND 10 YEAR BACKGROUND

ALL WHEAT FOR THE PAST DECADE

Year	Total Acreage	Average Acre Yield (bushels)	Total Production (bushels)	Farm Price Per Bushel Dec. 1 ($)	Farm Value on Dec. 1 ($)
1921	2,715,000	12.4	33,430,000	0.85	28,416,000
1922	3,618,000	14.5	52,714,000	0.89	46,916,000
1923	3,274,000	14.6	47,708,000	0.82	39,121,000
1924	3,163,000	16.4	51,799,000	1.24	64,230,000
1925	3,250,000	10.8	35,021,000	1.39	48,802,000
1926	3,570,000	12.5	44,744,000	1.12	50,123,000
1927	3,850,000	20.3	80,208,000	0.96	77,089,000
1928	4,275,000	18.2	77,998,000	0.83	65,036,000
1929	4,226,000	9.6	40,688,000	0.95	38,741,000
1930	3,913,000*	8.6*	33,698,000*	0.48*	16,332,000*

*Preliminary.

WHEAT

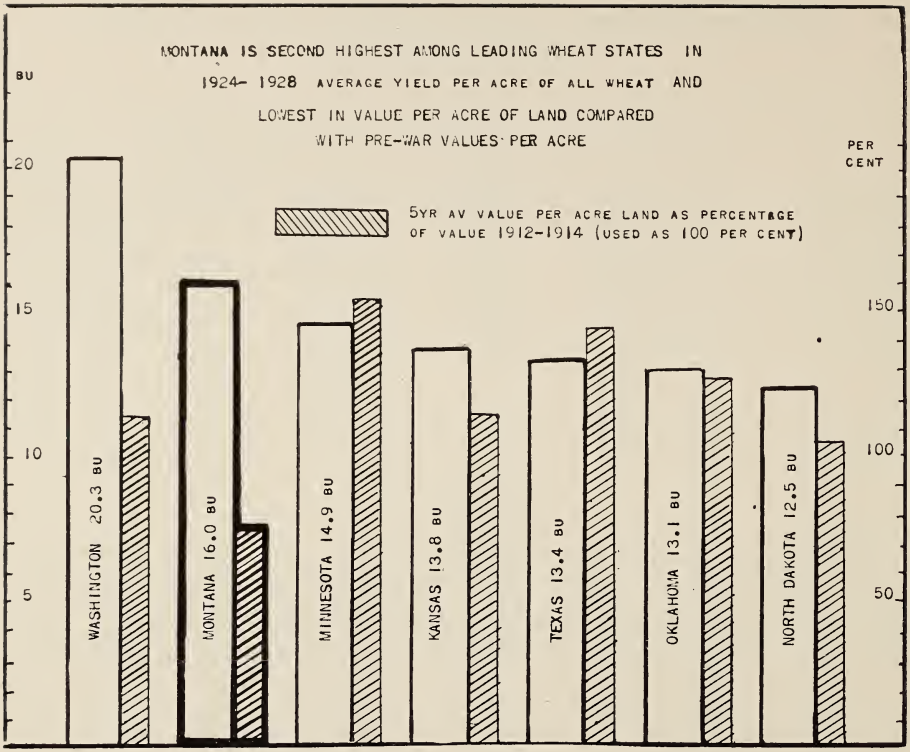
The 1930 wheat crop in Montana was characterized by the lowest yield per acre, the lowest farm price per bushel and the second smallest production in the past 10 years. The season of 1930 will be remembered by wheat growers in Montana as a year of drought and depression. No preceding year probably was more unprofitable considering both yield and price and none more discouraging since the poor yields and low prices of 1930 followed relatively poor yields of 1929.

The year of 1930, however, might well be considered the worst that could be expected in wheat production under Montana conditions and contrasts strikingly with such a season as 1927 when from a smaller acreage a crop of more than 80,000,000 bushels, worth about $77,000,000 exceeded in size that of 1930 by a ratio of more than 2 to 1 and in value by a ratio of nearly 5 to 1.

Some place between such extremes lies the crop that Montana farmers may reasonably expect from season to season, such a crop as would be represented by the average of the past five years. This average in Montana has been about 58,000,000 bushels with an average yield per acre of 16 bushels. In good seasons and with expanded acreage production in the future may approach the 100,000,000 bushels mark and in poor seasons, fall, as was the case in 1930, well under the 50,000,000 bushel mark. But over a period of years Montana's average yield per acre of wheat will compare closely with the average of the other leading wheat states of the nation as is shown in the following table:

AVERAGES FOR THE PERIOD 1924 TO 1928 INCLUSIVE

State	5-Yr. Average Acreage	5-Yr. Average Production	5-Yr. Average Yield
MONTANA	3,622,000	57,954,000	16.0
Kansas	9,797,000	106,526,000	13.8
Oklahoma	3,867,000	50,565,000	13.1
North Dakota	9,763,000	121,692,000	12.5
Texas	1,570,000	20,980,000	13.4
Minnesota	1,841,000	27,366,000	14.9
Washington	2,112,000	42,922,000	20.3



The accompanying graph shows Montana's average yield of wheat per acre and value per acre of farm land as a percentage of the pre-war (1912-1914) average, and comparable data for other leading wheat producing states. It will be noted in this comparison that Montana stands second in average yield per acre and lowest in the average value per acre of farm land. Since value of land on which wheat is grown is a measure of the cost of wheat production it would appear that Montana is favorably situated as a wheat producer. Another advantage of the wheat grower in Montana compared with wheat growers in other states is the quality of wheat grown under Montana conditions. Probably no wheat except that grown on the new prairie lands of western Canada will exceed Montana wheat in hardness and protein content year after year. Relatively less dockage from weed seed and other causes is characteristic of Montana wheat compared with that grown in other older wheat sections of the nation.

These advantages tend to offset the fact that Montana wheat moves relatively long distances to terminal markets.

Climatic conditions favoring the use of combines in harvesting wheat in Montana which were once considered a limiting factor in the use of combines have in recent years been offset to a large degree by the adaptation of combine harvesting machinery and accessories to Montana conditions. Windrowing wheat to permit drying and combining with pick-up attachments have been some of the ways in which the combine problem has been handled in recent years. The growth of the use of combines in Montana during the past five years has been marked. Since 1925 imports of combines have been estimated to have exceeded 6,000 and the total number used placed as high as 9,000. Montana is rated as the third state in the use of combines, being exceeded only by Kansas and Oklahoma.

ALL WHEAT BY COUNTIES

District and County	1929 REVISED Acreage	Acre Yield	Production (bushels)	1930 DECEMBER ESTIMATE Acreage	Acre Yield	Production (bushels)
NORTHWESTERN						
Deer Lodge	500	24.0	12,000	600	16.7	10,000
Flathead	26,000	14.7	382,000	27,000	14.1	381,000
Granite	3,000	10.1	30,000	3,000	15.0	45,000
Lake	30,000	14.8	444,000	31,000	18.4	570,000
Lincoln	1,500	11.5	17,000	1,500	18.0	27,000
Mineral	500	17.0	8,000	600	20.0	12,000
Missoula	10,000	13.1	131,000	10,000	14.5	145,000
Powell	3,500	14.5	51,000	3,500	16.5	58,000
Ravalli	7,000	18.0	126,000	7,100	15.5	110,000
Sanders	6,000	15.5	93,000	5,700	14.0	80,000
NORTH-CENTRAL						
Blaine	87,000	11.8	1,027,000	76,000	5.5	418,000
Choteau	303,000	12.7	3,848,000	300,000	7.9	2,370,000
Glacier	22,000	13.5	297,000	20,000	10.6	212,000
Hill	292,000	8.5	2,482,000	260,000	6.7	1,742,000
Liberty	80,000	9.7	776,000	70,000	9.0	630,000
Phillips	100,000	8.9	890,000	90,000	4.1	369,000
Pondera	120,000	14.2	1,704,000	120,000	15.1	1,812,000
Teton	150,000	13.3	1,995,000	145,000	13.1	1,900,000
Toole	78,000	12.1	944,000	66,000	10.0	660,000
NORTHEASTERN						
Daniels	175,000	4.5	788,000	160,000	10.2	1,632,000
Dawson	160,000	8.0	1,280,000	163,000	9.0	1,467,000
Garfield	44,000	5.9	260,000	49,000	5.2	255,000
McCone	123,000	6.5	787,000	125,000	9.1	1,138,000
Richland	164,000	9.0	1,476,000	150,000	11.0	1,650,000
Roosevelt	260,000	7.6	1,984,000	251,000	9.5	2,384,000
Sheridan	268,000	7.8	2,090,000	255,000	9.0	2,295,000
Valley	248,000	5.4	1,338,000	235,000	8.0	1,880,000
CENTRAL						
Broadwater	12,000	14.3	172,000	13,000	9.5	124,000
Cascade	132,000	14.0	1,848,000	126,000	9.0	1,092,000
Fergus	220,000	12.5	2,758,000	191,000	6.6	1,260,000
Golden Valley	30,000	5.3	159,000	30,000	5.0	150,000
Judith Basin	138,000	8.6	1,104,000	120,000	7.2	864,000
Lewis and Clark	15,000	11.0	165,000	16,000	8.3	133,000
Meagher	4,000	6.1	24,000	5,000	5.6	28,000
Musselshell	38,000	6.1	228,000	37,000	4.5	166,000
Petroleum	24,000	5.7	137,000	23,000	4.1	94,000
Wheatland	20,000	5.7	114,000	25,000	5.0	125,000
SOUTHWESTERN						
Beaverhead	2,000	23.4	47,000	2,000	12.5	30,000
Gallatin	77,000	17.0	1,309,000	70,000	9.5	665,000
Jefferson	6,000	10.4	62,000	7,000	10.5	74,000
Madison	12,000	16.0	192,000	12,000	11.9	117,000
Silver Bow	.....	.....	.....	.....	.....	.....
SOUTH-CENTRAL						
Big Horn	66,000	10.3	680,000	60,000	8.0	480,000
Carbon	40,000	15.0	600,000	34,000	8.8	299,000
Park	25,000	13.8	345,000	20,000	6.5	130,000
Stillwater	101,000	9.1	919,000	75,000	4.0	300,000
Sweet Grass	15,000	7.7	116,000	8,000	4.2	66,000
Treasure	18,000	8.1	146,000	16,000	5.5	88,000
Yellowstone	104,000	10.3	1,071,000	92,000	6.8	626,000
SOUTHEASTERN						
Carter	19,000	9.8	186,000	16,000	9.0	144,000
Custer	32,000	8.6	275,000	25,000	10.6	265,000
Fallon	94,000	9.2	865,000	83,000	9.0	747,000
Powder River	13,000	11.8	153,000	10,000	7.5	75,000
Prairie	90,000	7.1	639,000	70,000	9.1	637,000
Rosebud	50,000	7.7	385,000	42,000	4.3	181,000
Wibaux	67,000	9.7	650,000	60,000	8.1	486,000
State totals	4,226,000	9.6	40,688,000	3,913,000	8.6	33,698,000

CLASSES OF WHEAT IN MONTANA

Winter wheat, durum wheat and hard spring wheat of bread quality are grown in Montana but the leading class is spring wheat other than durum. Acreage, yield and production of winter and all spring wheat for the past 10 years are shown in the following table and production of durum wheat alone for the past five years. In general the tendency has been to restrict winter wheat acreage more and more to those localities where it has definite advantages compared with spring wheat. Durum wheat is almost a negligible item in total wheat production in Montana. Most of the expansion of wheat acreage in the state in the past 10 years has taken place in acreage of spring wheat other than durum.

SUMMARY OF ALL DATA FOR ALL SPRING WHEAT

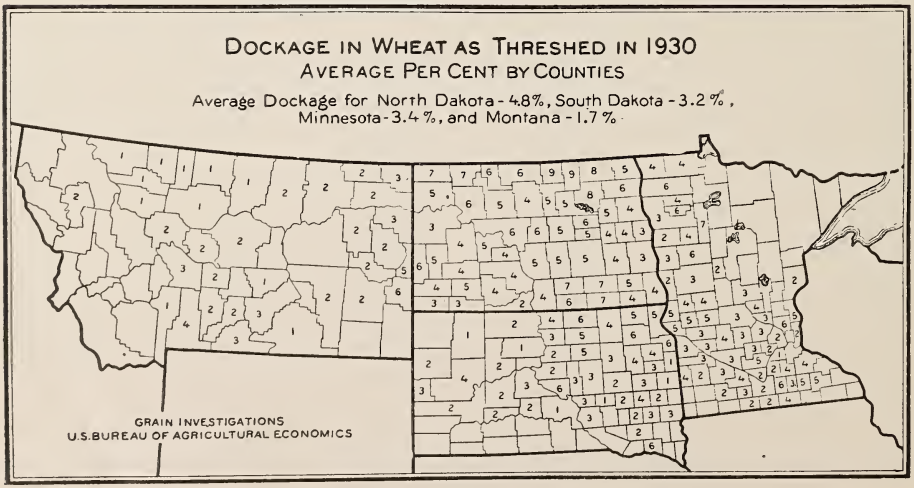
	1930 Crop	1929 Crop	1924-28 Average
Area Harvested (acres)	3,298,000	3,664,000	3,049,000
Yield per acre (bushels)	8.5	9.0	15.9
Production (bushels)	28,033,000	32,976,000	51,456,000
Quality (per cent)	88	82	.....
Weight per measured bushel (lbs.)	58.2	58.0	.....

DURUM WHEAT

	1930 Crop	1929 Crop	1924-28 Average
Area harvested (acres)	30,000	30,000	26,000
Yield per acre (bushels)	7,500	8.8	14.7
Production (bushels)	225,000	264,000	383,000
Quality (per cent)	90	83	.....
Weight per measured bushel (lbs.)	.....	.....	.....

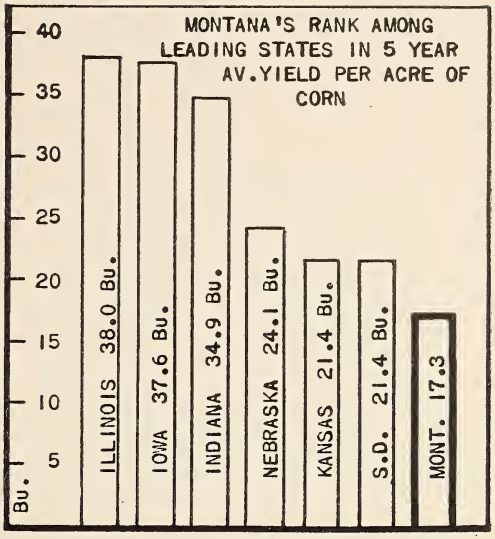
SUMMARY OF DATA FOR WINTER WHEAT

	1930 Crop	1929 Crop
Area planted preceding fall (acres)	760,000	768,000
Abandonment between planting and harvest (acres)	175,000	236,000
Area harvested (acres)	585,000	532,000
Yield per acre (bushels)	9.3	14.0
Total production (bushels)	5,440,000	7,448,000
Quality (per cent)	69	70
Weight per measured bushel (pounds)	58.9	58.5


DOCKAGE IN WHEAT AS THRESHED IN 1930
AVERAGE PER CENT BY COUNTIES
Average Dockage for North Dakota - 4.8%, South Dakota - 3.2%, Minnesota - 3.4%, and Montana - 1.7%
GRAIN INVESTIGATIONS
U.S. BUREAU OF AGRICULTURAL ECONOMICS

CORN

The 1930 corn production in Montana was reduced considerably by drought and was the smallest total corn crop in the past 10 years. Besides a relatively low yield per acre, acreage planted in 1930 also shows some curtailment compared with preceding years and continued a rather pronounced downward trend in corn acreage that began in 1925. Prior to this time there had been a rapid expansion of corn acreage which carried the crop into a large number of counties. The crop apparently has proven satisfactory in east-central, parts of south-central and southeastern Montana, these areas as a rule having warmer summers and somewhat longer growing seasons than the rest of the state.



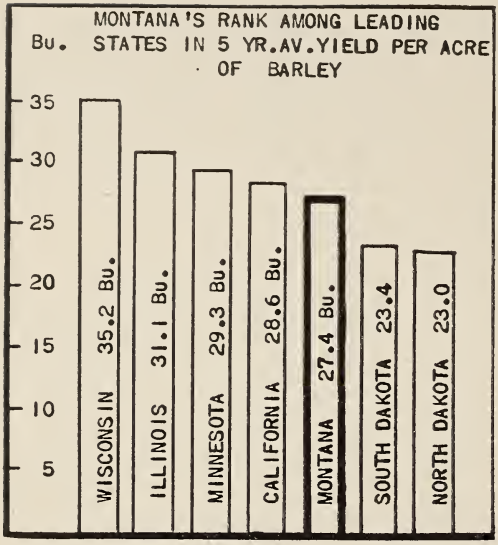
CORN FOR THE PAST DECADE

Year	Total Acreage	Average Acre Yield (bushels)	Total Production (bushels)	Farm Price Per Bushel Dec. 1 ($)	Farm Value on Dec. 1 ($)
1921	190,000	20.0	3,800,000	0.67	2,546,000
1922	228,000	24.3	5,540,000	0.53	2,936,000
1923	365,000	26.0	9,490,000	0.65	6,168,000
1924	420,000	18.0	7,560,000	0.99	7,484,000
1925	399,000	16.5	6,584,000	0.95	6,255,000
1926	359,000	11.0	3,949,000	0.92	3,633,000
1927	305,000	23.5	7,168,000	0.72	6,161,000
1928	274,000	19.0	5,206,000	0.82	4,269,000
1929	301,000	12.0	3,612,000	0.84	3,034,000
1930	271,000*	12.0*	3,252,000*	0.66*	2,146,000*

*Preliminary.

Corn production is estimated on the basis of grain equivalent and not utilization. Very little of the crop was actually harvested as ear corn in 1930 and as a rule the proportion so harvested is seldom larger than a third. A small percentage is utilized as silage and the bulk is used for forage, either cut for feeding or hogged off. The rise of the corn crop as one of Montana's feed crops was rapid during the first half of the past decade, but unfavorable corn years together with the development of feed barley types checked this expansion in about 1925, since which time corn acreage has tended to recede back to those counties where conditions are more favorable. Montana is of small national consequence as a corn producer. Her average yields of corn compared with leading corn states are shown in the accompanying graph.

BARLEY



From a place of minor importance in 1921, barley acreage in Montana by 1930 had assumed a place second only to oats as a leading feed grain crop. Production in 1930, however, was curtailed severely by drought which resulted in the second lowest acre yield of the decade. Both oats and barley are consumed in large part within the state, very little finding its way into outside shipments. The rapid development of barley acreage during the past 10 years has been due both to the introduction of new feed types of barley and to the expansion of livestock numbers other than horses. As an alternative crop for oats it has apparently gained in popularity since most of the decreased oats acreage of the past 10 years has gone into barley. Among the leading barley producing states of the nation Montana ranks fifth, being exceeded slightly by California and exceeding in turn the states of South Dakota and North Dakota. These comparisons are shown in the accompanying graph.

BARLEY FOR PAST DECADE

Year	Total Acreage	Average Acre Yield (bushels)	Total Production (bushels)	Farm Price Per Bushel Dec. 1 ($)	Farm Value on Dec. 1 ($)
1921	75,000	20.5	1,538,000	0.60	923,000
1922	92,000	25.0	2,300,000	0.50	1,150,000
1923	105,000	25.5	2,678,000	0.48	1,285,000
1924	104,000	25.0	2,600,000	0.69	1,794,000
1925	156,000	21.0	3,276,000	0.72	2,359,000
1926	150,000	24.0	3,600,000	0.64	2,304,000
1927	195,000	33.0	6,435,000	0.60	3,861,000
1928	209,000	30.5	6,374,000	0.56	3,569,000
1929	251,000	16.0	4,016,000	0.68	2,731,000
1930*	226,000	16.5	3,729,000	0.41	1,529,000

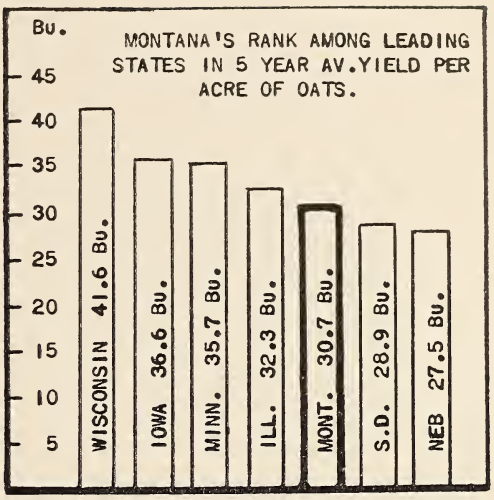
*Preliminary.

CLOVER SEED

Production of red and alsike clover seed in Montana has been negligible but the production of sweet clover seed has been steadily increasing from the 540,000 pounds crop of 1924 from an acreage of 3,000 up to 1928, when from an acreage of 7,000, 1,890,000 pounds were harvested. In 1929 the acreage receded to the 3,000 mark, where it remained during 1930, with a production of 810,000 pounds in 1929 and 630,000 pounds in 1930. The average price per bushel on December 1, paid to growers for sweet clover seed was $4.30 for 1929 and $3.70 for the 1930 crop.

OATS

Oats production in Montana has shown a marked decline in the past 10 years with acreage in 1930 registering the lowest for that period. Production in 1930 was also the lowest in the decade due to the drought which reduced yields. The decline in oats production has parallelled a similar downward trend in horse numbers although feed needs of other classes of livestock have increased in the past 10 years. These needs have been largely met by increases in production of other feed crops, particularly of barley and tame hay. While the estimated oats production in Montana is shown in equivalent bushels, not all of the crop is threshed for grain.



In estimated 5-year average yield per acre of oats, Montana is ranked fifth among the leading oats states of the nation, being only slightly lower than Illinois and exceeding in yields South Dakota and Nebraska. Montana's relative rank is shown in the accompanying graph.

OATS FOR PAST DECADE

Year	Total Acreage	Average Acre Yield (bushels)	Total Production (bushels)	Farm Price Per Bushel Dec. 1 ($)	Farm Value on Dec. 1 ($)
1921	618,000	24.0	14,832,000	0.34	5,043,000
1922	660,000	32.0	21,120,000	0.37	7,814,000
1923	673,000	33.0	22,209,000	0.38	8,439,000
1924	570,000	29.5	16,815,000	0.47	7,903,000
1925	605,000	22.5	13,612,000	0.53	7,214,000
1926	641,000	26.0	16,666,000	0.53	8,833,000
1927	596,000	40.0	23,840,000	0.44	10,490,000
1928	554,000	36.5	20,221,000	0.41	8,291,000
1929	554,000	17.0	9,418,000	0.51	4,833,000
1930*	526,000	17.5	9,205,000	0.31	2,854,000

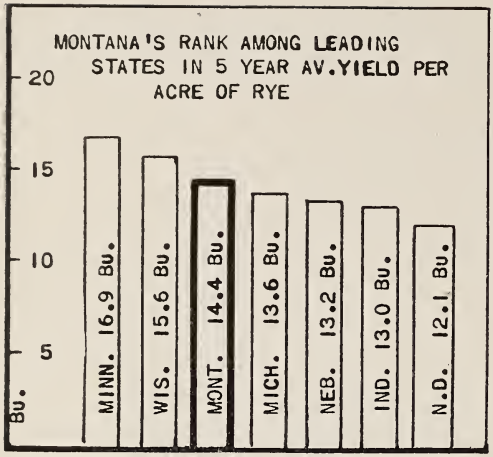
*Preliminary.

ALFALFA SEED

Montana again ranks fourth in the production of the nation's supply of alfalfa seed with production in 1930 placed at 5,100,000 pounds valued at $867,000 on a basis of the December 1, farm price per bushel of $10.10 compared with the 1929 value of $828,000 based on the bushel price of $11.50 in that year. The 1930 production showed an increase of 780,000 pounds over that of 1929 with an increase of 3,000 acres devoted to production of alfalfa seed over that of 1929, when 30,000 acres were harvested, giving a production of 4,320,000 pounds, compared with the 1930 production of 5,100,000 pounds. The increase in production in 1930 resulted from an increase in acreage harvested and a slight increase in yield per acre. Prices paid to growers for the 1930 crop averaged below the 1929 price, although the farm value was nearly $40,000 greater in 1930 than in 1929.

Practically half of the alfalfa seed produced in Montana is grown by farmers raising registered Grimm and Cossack seed. Quality of Montana seed is generally recognized and a ready market is usually found outside the state for this crop.

RYE



Rye acreage and production during the past decade, although showing occasional strong yearly shifts, has been characterized by little net change. The 1930 crop was the poorest from yield per acre standpoint of any year of the decade. Considerable rye has found its way into Montana shipments in years when prices have favored such exports. However there is a growing tendency to regard it as a feed crop rather than as a cash crop. The 1930 farm price for rye was the lowest in many years averaging but 25 cents per bushel.

In average yield per acre for rye Montana ranks third among the eight important rye producing states, being exceeded only by Minnesota and Wisconsin and exceeding in turn North Dakota, Nebraska, and Michigan. Comparisons are shown in the accompanying graph.

RYE FOR THE PAST DECADE

Year	Total Acreage	Average Acre Yield (bushels)	Total Production (bushels)	Farm Price Per Bushel Dec. 1 ($)	Farm Value on Dec. 1 ($)
1921	116,000	11.2	1,299,000	0.53	688,000
1922	240,000	14.0	3,360,000	0.54	1,814,000
1923	156,000	11.0	1,716,000	0.51	875,000
1924	80,000	14.0	1,120,000	0.91	1,019,000
1925	80,000	12.5	1,000,000	0.74	740,000
1926	107,000	12.0	1,284,000	0.75	963,000
1927	134,000	18.0	2,412,000	0.73	1,761,000
1928	154,000	14.0	2,156,000	0.69	1,488,000
1929	111,000	11.0	1,221,000	0.72	879,000
1930	113,000	10.0	1,130,000	0.25	282,000

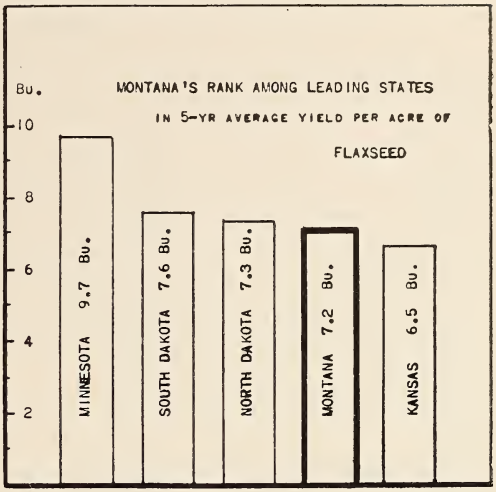
APPLES

There was slightly less than three per cent reduction in apple production in 1930, compared with 1929 as shown by a 1930 production of 410,000 bushels against the 1929 production of 420,000 bushels. The commercial apple crop for 1930 was placed at 115,000 barrels compared with the same figure for the revised 1929 estimate. Prices to growers in 1930 were slightly less favorable than the 1929 price, but better than the five-year average, being placed at $1.20 per bushel compared with the price for the preceding year of $1.30 and the five-year average (1924-28) price of $1.15 per bushel.

APPLES FOR THE PAST DECADE

Year	Total Production (bushels)	Farm Price Per Bushel Dec. 1 ($)	Farm Value on Dec. 1 ($)
1921	975,000	1.50	1,465,000
1922	610,000	1.00	610,000
1923	990,000	1.30	1,287,000
1924	290,000	1.29	374,000
1925	80,000	1.75	140,000
1926	325,000	1.20	390,000
1927	295,000	1.30	384,000
1928	516,000	.90	464,000
1929	420,000	1.30	546,000
1930	410,000	1.20	492,000

FLAX PRODUCTION IN THE PAST DECADE

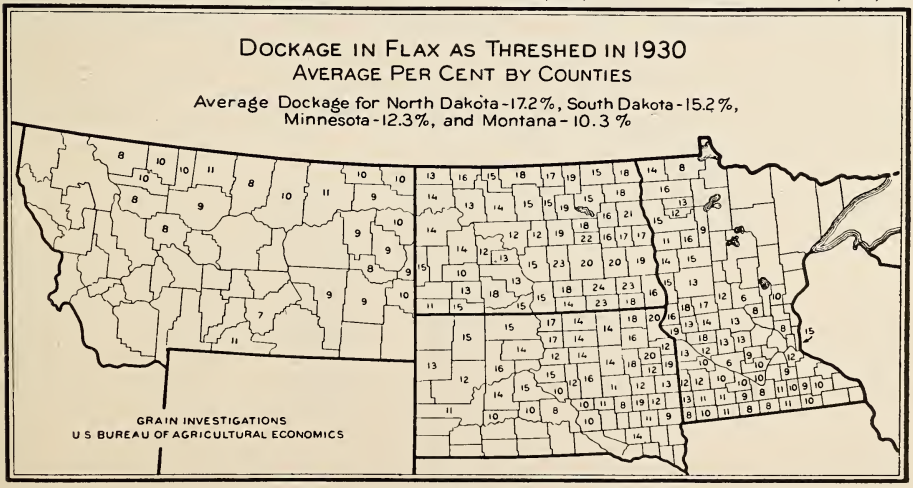


Flax has always played an important part in Montana's crop system. In the early days of the settlement period, flax was regarded as the breaking crop by which the virgin lands were brought into crop production. In these days large acreages of flax were planted year after year as new lands were brought into production. With the passing of the settlement period, flax acreage in Montana tended to decline and had reached a relatively low point of 110,000 acres at the beginning of the last decade. However, in the past 10 years flax has taken an important place with wheat as one of Montana's outstanding cash crops and to an increasing extent has been grown in rotation systems. The past decade has been marked by a tendency to steadily increase flax acreage despite occasional fluctuations brought about by weather conditions and prices as between flax and wheat. From 110,000 acres in 1921, flax acreage expanded to 480,000 acres in 1930.

In both 1930 and 1929 production of flax was consistently curtailed by drought, average yields per acre falling from 8.5 bushels in 1928 to 3.2 bushels in 1929 and 3.7 bushels in 1930. Among the leading flax producing states, Montana ranks fourth in 5-year average yield, being exceeded by Minnesota, South Dakota and North Dakota. These comparisons are shown in the accompanying graph.

FLAXSEED FOR THE PAST DECADE

Year	Total Acreage	Average Acre Yield (bushels)	Total Production (bushels)	Farm Price Per Bushel Dec. 1 ($)	Farm Value on Dec. 1 ($)
1921	110,000	5.0	550,000	1.40	770,000
1922	84,000	7.2	605,000	1.97	1,192,000
1923	110,000	8.2	902,000	1.93	1,741,000
1924	246,000	8.7	2,140,000	2.21	4,729,000
1925	244,000	4.5	1,098,000	2.20	2,416,000
1926	165,000	4.2	693,000	1.85	1,282,000
1927	170,000	10.2	1,734,000	1.75	3,034,000
1928	183,000	8.5	1,556,000	1.92	3,988,000
1929	343,000	3.2	1,098,000	2.80	3,074,000
1930	480,000	3.7	1,776,000	1.31	2,327,000


DOCKAGE IN FLAX AS THREshed IN 1930
AVERAGE PER CENT BY COUNTIES
Average Dockage for North Dakota-17.2%, South Dakota-15.2%,
Minnesota-12.3%, and Montana-10.3%
GRAIN INVESTIGATIONS
U.S. BUREAU OF AGRICULTURAL ECONOMICS

FLAXSEED BY COUNTIES

District and County	1929 REVISED Acreage	Acre Yield	Production (bushels)	1930 DECEMBER ESTIMATE Acreage	Acre Yield	Production (bushels)
NORTH-CENTRAL						
Blaine	20,000	5.5	110,000	35,000	5.6	196,000
Choteau	3,000	4.0	12,000	4,200	4.6	19,000
Glacier	5,000	8.0	40,000	6,000	7.5	45,000
Hill	18,000	2.1	38,000	21,500	3.2	69,000
Liberty	5,000	3.0	15,000	5,000	2.6	13,000
Phillips	13,000	2.8	36,000	14,000	2.2	31,000
Pondera	7,000	4.3	30,000	8,000	6.9	55,000
Teton	5,000	5.0	21,000	4,200	5.3	26,000
Toole	9,000	5.5	50,000	9,300	3.0	28,000
NORTHEASTERN						
Daniels	16,000	1.5	24,000	23,000	4.5	104,000
Dawson	30,000	2.9	87,000	39,000	4.0	156,000
Garfield	12,000	2.5	30,000	20,000	2.5	50,000
McCone	33,000	1.5	50,000	43,000	3.5	150,000
Richland	22,000	2.8	62,000	29,000	3.0	87,000
Roosevelt	17,000	2.3	39,000	23,000	3.5	80,000
Sheridan	30,000	3.4	102,000	39,000	3.0	117,000
Valley	17,000	2.0	34,000	24,000	3.5	84,000
CENTRAL						
Cascade	700	4.3	3,000	1,000	6.0	6,000
Fergus	1,000	4.0	4,000	1,000	3.7	4,000
Golden Valley	300	3.0	1,000	500	2.0	1,000
Judith Basin	300	3.0	1,000	500	2.0	1,000
SOUTH-CENTRAL						
Big Horn	8,500	4.0	34,000	9,000	1.9	17,000
Sweet Grass	300	3.0	1,000	500	2.0	1,000
Yellowstone	600	1.6	1,000	500	2.0	1,000
SOUTHEASTERN						
Carter	6,000	4.1	25,000	10,000	3.9	39,000
Custer	9,000	4.0	36,000	16,000	3.2	51,000
Fallon	16,000	4.0	64,000	25,000	4.5	112,000
Powder River	12,300	5.9	72,000	22,000	4.0	88,000
Prairie	16,000	2.5	40,000	26,000	2.5	65,000
Rosebud	4,000	3.0	12,000	8,000	4.0	32,000
Wibaux	6,000	4.0	24,000	12,000	4.0	48,000
State totals	343,000	3.2	1,098,000	480,000	3.7	1,776,000

SUGAR BEETS

A marked expansion in sugar beet acreage took place in 1930, when 45,000 acres were harvested, compared with 38,000 acres for 1929, and the 5-year average acreage of 30 800. This increased acreage produced the record crop for the state, being 578,000 tons compared with the 1929 production of 386,000 tons and the 5-year (1924-28) average production of 324,000 tons. Yield per acre in 1930 also topped the yields of any year since estimates of this crop were begun, being placed at 12.774 tons per acre.

Four factories within the state handle the production of sugar from beets raised in Montana. The Utah-Idaho Sugar Company at Chinook, the Amalgamated Sugar Company at Missoula; the Great Western Sugar Company at Billings and the Holly Sugar Corporation at Sidney.

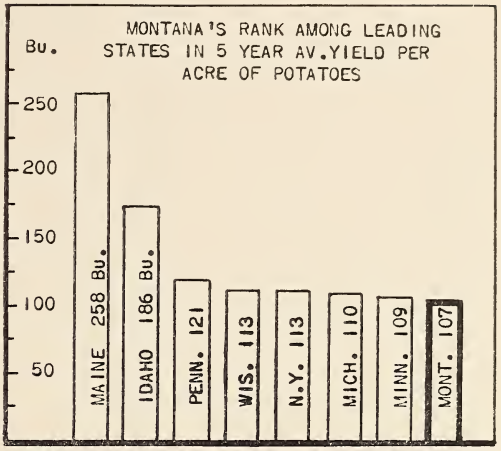
SUGAR BEETS FOR THE PAST SEVEN YEARS

Year	Total Acreage	Average Acre Yield (tons)	Total Production (tons)	Farm Price Per Ton Dec. 1 ($)	Farm Value on Dec. 1 ($)
1924	31,000	10.5†	326,000	10.00	3,260,000
1925	30,000	10.5†	315,000	6.75	2,126,000
1926	30,000	11.6†	348,000	7.82	2,724,000
1927	32,000	11.4†	364,000	8.22	2,996,000
1928	28,000	9.2†	258,000	7.36	1,897,000
1929	38,000	10.2†	386,000	7.29	2,815,000
1930*	45,000	12.5†	564,000	‡	‡

*Preliminary.
†Tons.
‡Not available.

THE PAST DECADE IN POTATO PRODUCTION

Drought conditions prevailing in both 1929 and 1930 reduced the acreage devoted to potato production below any year since 1921. However, in 1930 the yield per acre and total production exceeded the 1929 yield and production by a margin, in case of acre yield, of 16 bushels and approximately 24,000 bushels in case of total production. During the past 10 years acreage has shown a marked decline, reaching 29,000 acres in 1930 compared with 41,000 acres harvested in 1921. With 61 per cent of the state's potato acreage grown on non-irrigated lands, the drought conditions which have prevailed during the past two years cut yields well below any year in the decade just passed.



The December 1 farm price to growers for their 1930 potatoes was $1.10 per bushel compared with an average of $1.70 per bushel on December 1, 1929, and 55 cents the December price paid for the 1928 crop. Due to the lower price for the 1930 crop, farm value fell below that of 1929 but exceeded slightly that of 1928.

SUMMARY OF DATA CONCERNING POTATOES BY CROP YEARS

Crop	Total Production (bushels)	Number Cars Shipped	Per Cent of Total Crop Shipped	December 1 Price
1921	4,715,000	1,834	25.3	$0.80
1922	5,670,000	1,412	16.2	0.40
1923	3,960,000	1,751	12.3	0.65
1924	2,992,000	755	16.4	0.87
1925	3,780,000	405	7.0	1.60
1926	2,975,000	1,509	33.0	1.20
1927	4,860,000	888	12.8	0.65
1928	4,255,000	1,376	22.6	0.55
1929	1,980,000	380	13.4	1.70
1930	2,204,000	474*	.....	1.10

Car lots based on B. A. E. car lot forwardings.

* Season to date of April, 1931.

The accompanying graph shows Montana's rank with the more important potato growing states in 5-year average yield per acre.

POTATOES FOR PAST DECADE

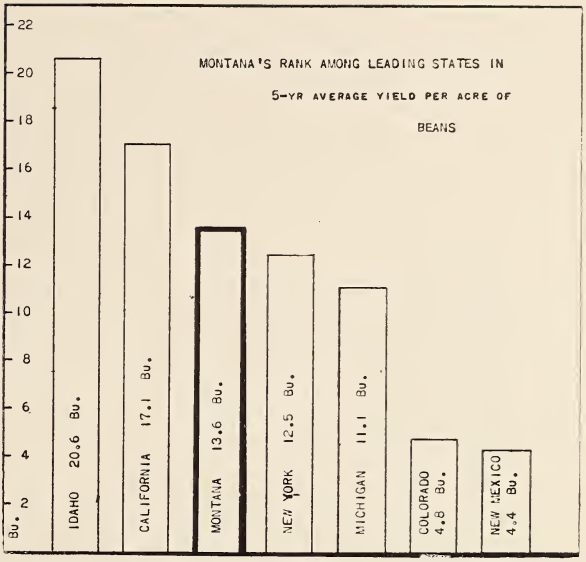
Year	Total Acreage	Average Acre Yield (bushels)	Total Production (bushels)	Farm Price Per Bushel Dec. 1 ($)	Farm Value on Dec. 1 ($)
1921	41,000	115	4,715,000	0.80	3,772,000
1922	45,000	126	5,670,000	0.40	2,268,000
1923	36,000	110	3,960,000	0.65	2,574,000
1924	34,000	88	2,992,000	0.87	2,603,000
1925	35,000	108	3,780,000	1.60	6,048,000
1926	35,000	85	2,975,000	1.20	3,570,000
1927	36,000	135	4,860,000	0.65	3,159,000
1928	37,000	115	4,255,000	0.55	2,340,000
1929	33,000	60	1,980,000	1.70	3,366,000
1930	29,000	76	2,204,000	1.10	2,424,000

POTATOES BY COUNTIES

District and County	1929 REVISED Acreage	Acre Yield	Production (bushels)	1930 DECEMBER ESTIMATE Acreage	Acre Yield	Production (bushels)
NORTHWESTERN						
Deer Lodge	1,800	50	90,000	1,500	80	120,000
Flathead	3,000	50	150,000	2,500	70	175,000
Granite	200	70	14,000	200	70	14,000
Lake	900	61	55,000	700	70	49,000
Lincoln	500	66	33,000	400	85	34,000
Mineral	100	59	6,000	100	75	75,000
Missoula	1,000	80	80,000	800	90	72,000
Powell	800	80	64,000	600	80	48,000
Ravalli	1,600	86	138,000	1,200	90	108,000
Sanders	400	72	29,000	300	80	24,000
NORTH-CENTRAL						
Blaine	1,500	80	120,000	1,100	115	126,000
Chouteau	300	65	20,000	300	80	24,000
Glacier	200	50	10,000	200	70	14,000
Hill	600	55	33,000	500	65	32,000
Liberty	100	75	8,000	100	80	8,000
Phillips	600	50	30,000	500	60	30,000
Pondera	300	75	22,000	300	80	24,000
Teton	300	70	21,000	300	85	26,000
Toole	200	65	13,000	200	80	16,000
NORTHEASTERN						
Daniels	300	50	15,000	300	60	18,000
Dawson	700	50	35,000	600	65	39,000
Garfield	500	31	16,000	500	50	25,000
McCone	400	30	12,000	400	52	21,000
Richland	700	50	35,000	600	50	30,000
Roosevelt	500	40	20,000	500	45	22,000
Sheridan	600	34	20,000	600	40	24,000
Valley	600	40	24,000	500	45	22,000
CENTRAL						
Broadwater	400	50	20,000	400	60	24,000
Cascade	1,600	55	88,000	1,500	63	94,000
Fergus	1,000	50	50,000	900	70	63,000
Golden Valley	200	40	8,000	200	65	13,000
Judith Basin	400	65	26,000	400	72	30,000
Lewis and Clark	1,500	50	75,000	1,400	65	91,000
Meagher	100	50	5,000	100	60	6,000
Musselshell	400	48	19,000	400	55	22,000
Petroleum	100	50	5,000	100	60	6,000
Wheatland	200	50	10,000	200	50	12,000
SOUTHWESTERN						
Beaverhead	300	80	24,000	300	90	27,000
Gallatin	900	80	72,000	800	95	76,000
Jefferson	400	88	35,000	400	95	38,000
Madison	800	70	56,000	700	90	63,000
Silver Bow	.....	.....	.....	.....	.....	.....
SOUTH-CENTRAL						
Big Horn	300	80	24,000	300	90	27,000
Carbon	700	55	38,000	600	70	42,000
Park	500	70	35,000	400	85	35,000
Stillwater	400	65	26,000	400	80	32,000
Sweet Grass	200	60	12,000	200	70	14,000
Treasure	200	60	12,000	200	75	15,000
Yellowstone	1,100	70	77,000	900	90	81,000
SOUTHEASTERN						
Carter	200	60	12,000	200	70	13,000
Custer	600	65	39,000	500	80	40,000
Fallon	300	60	18,000	300	70	21,000
Powder River	300	58	16,000	300	60	18,000
Prairie	300	50	15,000	300	60	18,000
Rosebud	500	55	28,000	400	80	32,000
Wibaux	400	54	22,000	400	79	31,000
State totals	33,000	60	1,980,000	29,000	76	2,204,000

BEANS

In national production of edible beans, Montana again ranks seventh. The production of edible beans in the state is largely confined to the Great Northern variety which makes up roughtly 95 per cent of the total production in Montana. The principal competition comes from Wyoming and Idaho. Average yield per acre and production for these three states in 1929 and 1930 were as follows:



State	1930 Acreage	1930 Yield	1930 Production	1929 Acreage	1929 Yield	1929 Production
Montana	60,000	11.5	690,000	60,000	11.0	660,000
Idaho	115,000	21.0	2,415,000	92,000	23.0	2,116,000
Wyoming	33,000	22.0	726,000	31,000	18.5	574,000

Among the leading bean producing states Montana ranks third in five years average yield per acre, with an average of 13.6 bushels and exceeding the states of New York, Michigan, Colorado and New Mexico, and being in turn exceeded by California and Idaho. The accompanying graph shows these comparisons.

Beans are comparatively a new crop in Montana and one that has assumed commercial production only within the past decade. Estimates of production began in 1922 when 4,000 acres gave a production of 52,000 bushels, worth, according to the December 1 farm price $179,000 on basis of $3.45 per bushel on that date. The steady increase in both the area of production and acreage per grower has carried acreage in 1930 to 60,000 and production to 690,000 bushels valued at $1,690,000 on basis of the December 1 farm price per bushel of $2.45.

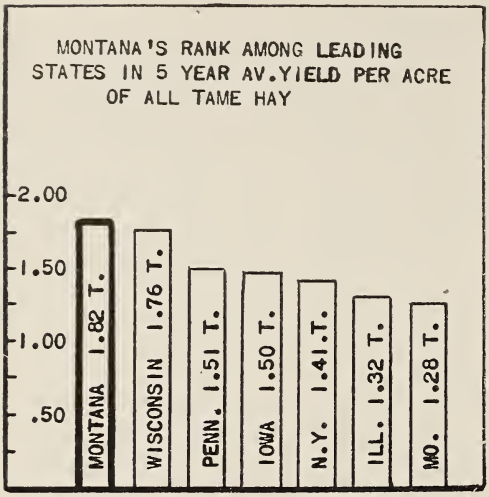
The bulk of the bean acreage is located in the Yellowstone valley and tributary areas with the principal local markets at Billings and Hardin.

BEANS FOR PAST NINE YEARS

Year	Total Acreage	Average Acre Yield (bushels)	Total Production (bushels)	Farm Price Per Bushel Dec. 1 ($)	Farm Value on Dec. 1 ($)
1922	4,000	13.0	52,000	3.45	179,000
1923	23,000	11.5	264,000	3.70	977,000
1924	25,000	12.0	300,000	3.30	990,000
1925	37,000	12.5	462,000	3.05	1,409,000
1926	43,000	10.0	430,000	2.80	1,204,000
1927	32,000	20.0	640,000	3.00	1,920,000
1928	40,000	14.5	580,000	3.85	2,233,000
1929	60,000	11.0	660,000	3.60	2,376,000
1930*	60,000	11.5	690,000	2.45	1,690,000

*Preliminary.

TAME HAY PRODUCTION IN THE PAST DECADE



Acreage devoted to the production of tame hay in Montana has steadily increased since 1921 when 1,045,000 acres were harvested, compared with the 1930 harvested acreage of 1,563,000. The expansion in acreage of hay during the past decade has been due to the increased numbers of livestock other than horses together with the fact that stockmen, seeing the need for plentiful feed stocks in years of shortage or severe winter feeding demands, plan ahead for carryover from year to year of this type of feed. Had it not been that the feeding demands of the past winter were exceptionally light, livestock would have suffered considerably from lack of feed, since the reserves of hay held over from the previous crop were considerably less than usual.

The 1929-1930 drought encouraged growers of hay to harvest all possible acreage in 1930 which accounts for the increase of about 133,000 acres in that year over 1929. Yields were reduced by the drought conditions and production in 1930 fell below any year since 1921 with the exception of 1921 and 1922.

Farm price of hay on December 1, in 1929 and 1930, was higher than for any other years in the past decade, being placed at $12.40 for December 1, 1929, and $11 per tone for 1930. The high price of hay in 1929 gave a December 1 farm value of more than $25,000,000 although production was 500,000 tons less than for 1928. In 1930, December 1, farm value fell below both 1928 and 1929, being placed at $22,099,000 for the state.

Among the leading hay producing states of the nation Montana ranks first in 5-year average yield per acre, with an average of 1.82 tons compared with Wisconsin's 1.76 tons; Pennsylvania's 1.51 tons; Iowa's 1.50 tons; New York's 1.41 tons; Illinois' 1.32 tons and Missouri's 1.28 tons. The accompanying graph shows these comparisons.

TAME HAY FOR THE PAST DECADE

Year	Total Acreage	Average Acre Yield (tons)	Total Production (tons)	Farm Price Per Ton Dec. 1 ($)	Farm Value on Dec. 1 ($)
1921	1,045,000	1.80	1,881,000	8.70	16,365,000
1922	1,045,000	1.89	1,975,000	9.00	17,775,000
1923	1,150,000	1.88	2,162,000	8.90	19,242,000
1924	1,206,000	1.74	2,102,000	10.00	21,020,000
1925	1,232,000	1.66	2,046,000	10.00	20,460,000
1926	1,309,000	1.58	2,063,000	10.50	21,661,000
1927	1,274,000	2.12	2,706,000	8.40	22,730,000
1928	1,294,000	1.98	2,558,000	8.90	22,766,000
1929	1,426,000	1.43	2,034,000	12.40	25,222,000
1930*	1,563,000	1.28	2,009,000	11.00	22,099,000

*Preliminary.

SEED AND CANNING PEAS

Seed peas, together with the sister crop of canning peas, constitute an important cash income source for Montana farmers. The acreage in 1930 devoted to seed peas was placed at 30,000 and was larger than any other year in the history of seed pea estimates in Montana. From this acreage, a crop of 525,000 bushels was produced, constituting one of the largest in the seven-year period and compares with the 1925 crop of 560,000 bushels and the 1926 crop of 520,000 bushels. The value of the 1930 crop is estimated at $1,050,000 compared with the 1929 value of $865 000 and came about through the markedly larger crop since there was about 100,000 bushels more seed peas produced in 1930 than in the preceding year.

CANNING PEAS

Canning peas acreage in 1930 fell off about 400 acres compared with the preceding year, being placed at 3,500 acres compared with the 1929 acreage of 3,900. Tonnage per acre, however, in 1930 exceeded the 1929 tonnage by a good margin, bringing the production for 1930 well above that of 1929, being placed at 4,095 tons or 8,190,000 pounds compared with the 1929 production of 3,627 tons, or 7,254,000 pounds. December 1, farm price of canning peas was placed at 2.3 cents per pound compared with the 1929 price of 2.5 cents per pound, giving a December 1 farm value of $188,000 for 1930 compared with $181,000 for 1929.

SEED PEAS FOR THE PAST SEVEN YEARS

Year	Total Acreage	Average Acre Yield (bushels)	Total Production (bushels)	Farm Price Per Bushel Dec. 1 ($)	Farm Value on Dec. 1 ($)
1924	24,000	17.5	420,000	2.25	945,000
1925	28,000	20.0	560,000	2.10	1,176,000
1926	26,000	20.0	520,000	2.00	1,040,000
1927	14,000	21.0	294,000	1.80	529,000
1928	19,000	17.5	332,000	2.00	664,000
1929	25,000	16.5	412,000	2.10	865,000
1930*	30,000	17.5	525,000	2.00	1,050,000

*Preliminary.

CHERRIES

Along the shores of the Flathead lake, a small commercial acreage of sweet cherries of the Bing and Lambert varieties is grown. In addition, sour cherries of the Montmorency and Morelli varieties are grown for canning in the Bitter Root Valley and canned at the Hamilton and Stevensville canneries.

Total production of cherries in Montana in 1930 was placed at 250 tons, compared with 280 tons in 1929 and the five-year average (1924-28) production of 230 tons. The large bulk of production of cherries in Montana is to be found in counties making up the Bitter Root and Flathead valleys of western Montana. The reduction in production in 1930 was the result of the lack of moisture prevailing during the past two years.

SHIPMENT DATA FOR SOME MONTANA CROPS BY CROP SEASONS

Year	Bushels of Wheat Shipped*	Bushels of Flax Shipped*	Bushels of Potatoes Shipped**	Bushels of Apples Shipped**
1920	29,843,000	1,095,000	645,000	349,000
1921	30,765,000	605,000	1,226,000	500,000
1922	44,172,000	474,000	917,000	297,000
1923	38,765,000	716,000	544,000	356,000
1924	42,772,000	1,779,000	290,000	128,000
1925	31,213,000	798,000	1,027,000	68,000
1926	37,255,000	496,000	591,000	265,000
1927	67,662,000	1,380,000	967,000	114,000
1928	78,257,000	1,550,000	533,000	382,000
1929	34,919,000	1,091,000	324,000	302,000

*Crop season July 1st to June 30th.
**Crop season August 1 to July 31st.
Computed on basis of car loadings as reported to Montana Railway Commission.

ACREAGE, YIELD PER ACRE, PRODUCTION, FARM PRICE PER UNIT ON DECEMBER 1, AND TOTAL FARM VALUE FOR THE STATE FOR 1929-1930 AND THE FIVE YEAR AVERAGE, 1924-28.

Crop and Year	Acreage	Yield Per Acre	Production (bushels)	Unit Price $	Farm Value on Dec. 1 $
CORN (Bu.)					
1930	271,000	12.0	3,252,000	.66	2,146,000
1929	301,000	12.0	3,612,000	.84	3,034,000
1924-28 Average	351,000	17.4	6,093,000	.88	5,360,000
WINTER WHEAT (Bu.)					
1930	585,000	9.3	5,440,000	.46	2,502,000
1929	532,000	14.0	7,448,000	.92	6,852,000
1924-28 Average	561,000	16.9	9,489,000	1.01	9,505,000
DURUM WHEAT (Bu.)					
1930	30,000	7.5	225,000	.42	94,000
1929	30,000	8.8	264,000	.88	232,000
1924-28 Average	26,000	14.7	383,000	1.10	423,000
OTHER SPRING WHEAT (Bu.)					
1930	3,298,000	8.5	28,033,000	.49	13,736,000
1929	3,664,000	9.0	32,976,000	.96	31,657,000
1924-28 Average	3,033,000	15.9	48,104,000	1.06	51,053,000
ALL WHEAT (Bu.)					
1930	3,913,000	8.6	33,698,000	.48	16,332,000
1929	4,226,000	9.6	40,688,000	.95	38,741,000
1924-28 Average	3,620,000	16.0	57,976,000	1.05	61,981,000
OATS (Bu.)					
1930	526,000	17.5	9,205,000	.31	2,854,000
1929	554,000	17.0	9,418,000	.51	4,803,000
1924-28 Average	589,000	30.7	18,082,000	.47	8,564,000
BARLEY (Bu.)					
1930	226,000	16.5	3,729,000	.41	1,529,000
1929	251,000	16.0	4,016,000	.68	2,731,000
1924-28 Average	163,000	27.3	4,457,000	.62	2,777,000
RYE (Bu.)					
1930	113,000	10.0	1,130,000	.25	282,000
1929	111,000	11.0	1,221,000	.72	879,000
1924-28 Average	111,000	14.4	1,594,000	.75	1,190,000
FLAXSEED (Bu.)					
1930	480,000	3.7	1,776,000	1.31	2,327,000
1929	343,000	3.2	1,098,000	2.80	3,074,000
1924-28 Average	202,000	7.2	1,466,000	2.00	2,931,000
POTATOES (Bu.)					
1930	29,000	76.0	2,204,000	1.10	2,424,000
1929	33,000	60.0	1,980,000	1.70	3,366,000
1924-28 Average	35,400	106.5	3,772,000	.94	3,544,000
BEANS, EDIBLE (Bu.)					
1930	60,000	11.5	690,000	2.45	1,690,000
1929	60,000	11.0	660,000	3.60	2,376,000
1924-28 Average	35,400	13.6	482,000	3.22	1,551,000
SUGAR BEETS (Tons)					
1930	45,000	12.77	578,000	.....	.....
1929	38,000	10.20	386,000	.....	.....
1924-28 Average	30,800	10.52	324,000	.....	.....
CANNING PEAS (Lbs.)					
1930	3,500	2,340	8,190,000	.023	188,000
1929	3,900	1,860	7,254,000	.025	181,000
1924-28 Average	2,800	2,700	7,460,000	.026	194,000
ALFALFA SEED (Bu.)					
1930	33,000	2.6	85,800	10.10	867,000
1929	30,000	2.4	72,000	11.50	828,000
1924-28 Average	20,200	2.6	51,800	12.88	667,000
SWEET CLOVER SEED (Bu.)					
1930	3,000	3.5	10,500	3.70	39,000
1929	3,000	4.5	13,500	4.30	58,000
1924-28 Average	5,600	4.2	23,500	5.62	132,000
ALL TAME HAY (Tons)					
1930	1,563,000	1.28	2,009,000	11.00	22,099,000
1929	1,426,000	1.43	2,034,000	12.40	25,222,000
1924-28 Average	1,251,000	1.83	2,295,000	9.42	21,628,000
WILD HAY (Tons)					
1930	572,000	.65	372,000	10.20	3,794,000
1929	636,000	.75	477,000	11.20	5,342,000
1924-28 Average	637,000	.96	609,000	8.38	5,105,000
ALL HAY (Tons)					
1930	2,135,000	1.12	2,381,000	10.87	25,893,000
1929	2,062,000	1.22	2,511,000	12.17	30,564,000
1928-24 Average	1,888,000	1.54	2,904,000	9.21	26,733,000

Crop and Year	Acreage	Yield Per Acre	Production (bushels)	Unit Price $	Farm Value on Dec. 1 $
APPLES (Bu.)					
1930	.....	.....	410,000	1.20	492,000
1929	.....	.....	420,000	1.30	546,000
1924-28 Average	.....	.....	315,000	1.15	363,000
CHERRIES (Tons)					
1930	.....	.....	250	125.00	31,000
1929	.....	.....	280	156.00	44,000
1924-28 Average	.....	.....	230	130.00	30,000
ALL OTHER CROPS (Value)					
1930	.....	.....	.....	.....	4,162,000
1929	.....	.....	.....	.....	2,842,000
1924-28 Average	.....	.....	.....	.....	3,874,000
ALL CROPS (Value)*					
1930	7,805,000	.....	.....	.....	61,256,000
1929	7,986,000	.....	.....	.....	94,067,000
1924-28 Average	7,090,000	.....	.....	.....	118,991,000

*Exclusive of value of farm gardens, forest, nursery and greenhouse products.

UNITED STATES ESTIMATES OF PRINCIPAL CROPS, ACREAGE, YIELD PER ACRE, PRODUCTION, FARM PRICE PER UNIT ON DECEMBER 1, AND TOTAL FARM VALUE FOR 1930 WITH 1929 FOR COMPARISON

Crop and Year	Acreage	Yield Per Acre	Total Production	Farm Price Dec. 1	Total Farm Value Based on Dec. 1
CORN (Bu.)					
1929	97,856,000	26.7	2,614,132,000	.781	2,042,893,000
1930	100,829,000	20.6	2,081,048,000	.663	1,378,874,000
WINTER WHEAT (Bu.)					
1929	40,059,000	14.4	576,213,000	1.065	613,321,000
1930	38,608,000	15.7	604,337,000	.643	388,627,000
DURUM WHEAT (Bu.)*					
1929	5,525,000	9.8	54,190,000	.881	47,762,000
1930	4,643,000	12.0	55,665,000	.451	25,113,000
OTHER SPRING WHEAT (Bu.)					
1929	15,880,000	11.3	178,773,000	1.016	181,647,000
1930	15,902,000	12.0	190,963,000	.543	103,667,000
ALL WHEAT (Bu.)					
1929	61,464,000	13.2	809,176,000	1.042	843,030,000
1930	59,153,000	14.4	850,965,000	.608	517,407,000
OATS (Bu.)					
1929	40,043,000	30.7	1,228,369,000	.435	533,807,000
1930	41,598,000	33.7	1,402,026,000	.324	453,973,000
BARLEY (Bu.)					
1929	13,068,000	23.2	302,892,000	.550	166,613,000
1930	12,437,000	26.2	325,893,000	.396	129,137,000
RYE (Bu.)					
1929	3,331,000	12.6	41,911,000	.864	36,225,000
1930	3,722,000	13.5	50,234,000	.416	20,895,000
FLAXSEED (Bu.)					
1929	3,050,000	5.6	17,049,000	2.842	48,459,000
1930	3,946,000	6.0	23,682,000	1.398	33,097,000
ALL HAY (tons)					
1929	74,203,000	1.53	113,658,000	11.76	1,336,946,000
1930	72,609,000	1.31	94,767,000	11.98	1,135,294,000
SWEET CLOVER SEED (Bu.)					
1929	207,000	4.19	867,700	3.65	3,166,000
1930	165,000	3.98	656,400	3.54	2,323,000
BEANS (Bu.)					
1929	1,960,000	10.6	20,707,000	3.78	78,371,000
1930	2,181,000	10.1	22,137,000	2.40	53,098,000
POTATOES (Bu.)					
1929	3,338,000	107.6	359,048,000	1.309	469,837,000
1930	3,394,000	106.4	361,090,000	.904	326,457,000
SUGAR BEETS (tons)					
1929	688,000	10.6	7,318,000	7.08	51,824,000
1930	799,000	11.5	9,175,000	7.15	65,561,000
APPLES (Bu.)					
1929	.....	.....	142,788,000	1.317	187,984,000
1930	.....	.....	163,543,000	.933	152,548,000

*Durum wheat reported for four states.

CENSUS NUMBER OF MONTANA FARMS 1930, 1925 and 1920

District and County	1930	1925	1920
NORTHWESTERN			
Deer Lodge	143	93	202
Flathead	1,362	1,238	1,923
Granite	247	227	354
Lake	1,199	964	.....
Lincoln	504	583	341
Mineral	96	103	95
Missoula	690	673	1,323
Powell	344	360	476
Ravalli	1,286	1,039	1,231
Sanders	662	669	667
NORTH-CENTRAL			
Blaine	1,288	1,135	1,761
Chouteau	1,588	1,649	2,573
Glacier	449	344	372
Hill	1,424	1,421	2,257
Liberty	399	446	515
Phillips	1,478	1,427	1,914
Pondera	917	794	1,060
Teton	1,027	1,089	1,135
Toole	594	605	933
NORTHEASTERN			
Daniels	901	1,020	.....
Dawson	1,020	1,105	1,195
Garfield	1,074	1,312	1,530
McCone	1,040	1,072	1,284
Richland	1,342	1,429	1,577
Roosevelt	1,281	1,267	1,215
Sheridan	1,492	1,487	2,408
Valley	1,832	1,925	2,169
CENTRAL			
Broadwater	327	321	466
Cascade	1,463	1,257	1,705
Fergus	2,075	1,918	4,226
Golden Valley	387	492	.....
Judith Basin	778	783	.....
Lewis and Clark	616	543	855
Meagher	280	310	447
Musselshell	524	650	1,604
Petroleum	363	.....	.....
Wheatland	326	386	688
SOUTHWESTERN			
Beaverhead	582	789	642
Gallatin	1,338	1,026	1,349
Jefferson	386	446	555
Madison	749	715	901
Silver Bow	213	180	331
SOUTH-CENTRAL			
Big Horn	1,085	1,260	791
Carbon	1,173	1,095	1,353
Park	661	619	756
Stillwater	958	946	1,370
Sweet Grass	534	632	863
Treasure	262	299	330
Yellowstone	1,748	1,960	2,211
SOUTHEASTERN			
Carter	848	770	855
Custer	696	716	941
Fallon	650	659	758
Powder River	899	838	833
Prairie	560	560	673
Rosebud	941	792	1,136
Wibaux	412	461	530
State Grand Totals	47,563	46,904	57,677

NOTE: 1930 census figures are preliminary.

ACREAGE CHANGES 1930

	1924	1926	1927	1928	1929	1930
TOTAL LAND AREA	93,532,840					
Land in farms	32,735,723					
Pasture land	22,714,811					
Improved pasture	4,144,050					
Wild	17,249,146					
Woodland	1,311,615					
Other land	1,546,688					
Total crop land	8,650,000	9,656,000	10,545,000	10,304,000	11,500,000	11,615,000
Total acres in crops	6,595,000	6,817,000	7,535,000	7,708,000	7,986,000	7,805,000
Grain crops total	4,526,000	4,827,000	5,080,000	5,466,000	5,443,000	5,039,000
Corn	420,000	359,000	305,000	274,000	301,000	271,000
ALL WHEAT	3,163,000	3,570,000	3,850,000	4,275,000	4,226,000	3,913,000
Winter wheat	620,000	521,000	648,000	803,000	532,000	585,000
Spring wheat	2,543,000	3,049,000	3,202,000	3,472,000	3,664,000	3,298,000
Durum wheat*	39,000	14,000	15,000	29,000	30,000	30,000
Oats	550,000	641,000	596,000	554,000	554,000	526,000
Barley	104,000	150,000	195,000	209,000	251,000	226,000
Rye	80,000	107,000	134,000	154,000	111,000	113,000
Other seed crops total	320,000	263,000	223,000	269,000	461,000	606,000
Beans	25,000	43,000	32,000	40,000	60,000	60,000
Seed peas	24,000	27,000	14,000	19,000	25,000	30,000
Flaxseed	246,000	165,000	170,000	183,000	343,000	480,000
Clover seed (sweet)	3,000	5,000	6,000	7,000	3,000	3,000
Alfalfa seed	19,000	23,000	11,000	20,000	30,000	33,000
ALL HAY and FORAGE	1,879,000	1,644,000	2,139,000	1,900,000	2,062,000	2,135,000
Timothy	100,000	101,000	101,000	101,000	106,000	106,000
Clover	51,000	50,000	56,000	67,000	60,000	56,000
Timothy and clover mixed	157,000	140,000	154,000	162,000	189,000	208,000
Alfalfa hay	598,000	592,000	710,000	689,000	744,000	737,000
Grain cut for hay	190,000	274,000	140,000	168,000	215,000	355,000
Other tame hay (all)	110,000	94,000	113,000	102,000	112,000	101,000
Wild hay cut	673,000	393,000	865,000	606,000	636,000	572,000
Potatoes	34,000	35,000	36,000	37,000	33,000	29,000
Other vegetables	5,000	5,000	5,000	5,000	5,000	5,000
Sugar beets	31,000	32,000	32,000	28,000	38,000	45,000
Canning peas	1,900	2,000	2,800	3,500	3,900	3,500
Crop failure	308,000	691,000	228,000	383,000	850,000	1,002,000
Idle and fallow land	1,750,000	2,140,000	2,782,000	2,205,000	2,790,000	2,800,000
Fruit crops (acres)	8,000	8,000	8,000	8,000	8,000	8,000
Apple trees (number)	712,000	577,000	577,000	577,000	577,000	577,000
Plum trees (number)	19,000	19,000	19,000	19,000	19,000	19,000

*Durum wheat included in spring wheat totals.

AVERAGE ACRE YIELDS

Crop	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	10-yr. Average
Spring wheat	12.0	14.4	14.0	16.2	10.5	12.2	20.6	19.0	9.0	8.5	13.64
Winter wheat	14.0	15.2	17.1	17.1	14.5	14.0	22.0	15.0	14.0	9.3	15.22
Corn	20.0	24.3	26.0	18.0	16.5	11.0	23.4	19.0	12.0	12.0	18.22
Oats	24.0	32.0	33.0	29.5	22.5	26.0	40.0	36.5	17.0	17.5	25.60
Barley	20.5	25.0	25.5	25.0	21.5	24.0	33.0	30.5	16.0	16.5	23.75
Rye	11.2	14.0	11.0	14.0	12.5	12.0	18.0	14.0	11.0	10.0	12.77
Flax	5.0	7.2	8.2	8.7	4.5	4.7	10.2	8.5	3.2	3.7	6.19
Potatoes	115.0	126.0	110.0	88.0	108.0	85.0	135.0	115.0	60.0	76.0	101.80
Tame hay	1.80	1.80	1.89	1.71	1.65	1.59	2.12	1.98	1.43	1.28	1.72
Wild hay	.80	.90	.91	.90	.90	.80	1.15	.90	.75	.65	.87
Beans*	.....	13.0	11.5	12.0	12.5	10.0	20.0	14.5	11.0	11.5	*12.90
Sugar beets†	.....	.....	.....	10.5	10.5	11.0	11.4	9.0	10.2	12.5	†10.73

*Available for only 9 years. (9-year average.)
†Available for only 7 years. (7-year average.)

ACRE VALUE OF CROPS

Crops	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930**	10-yr. Av.
S. wheat	$10.20	$12.82	$15.96	$20.00	$14.70	$13.92	$19.98	$15.96	$8.64	$4.62	$13.68
W. wheat	11.90	13.53	12.00	21.20	19.29	14.98	20.24	12.00	12.88	4.28	14.24
Corn	13.40	12.88	15.58	17.82	15.68	10.12	16.92	15.58	10.08	7.92	13.60
Oats	8.16	11.84	14.97	13.82	11.92	13.78	17.60	14.97	8.67	5.42	12.12
Barley	12.30	12.50	17.08	17.25	15.12	15.36	19.80	17.08	10.88	6.76	14.41
Rye	5.94	7.56	9.66	12.74	9.25	9.00	13.14	9.66	7.92	2.50	8.74
Flax	7.00	12.24	16.32	19.22	9.90	8.69	17.85	16.32	8.96	4.85	12.14
Potatoes	92.00	50.40	63.25	76.56	172.80	102.00	87.75	63.25	102.00	83.60	89.36
Tame hay	15.66	17.01	17.62	17.64	16.61	16.50	17.80	17.62	17.73	14.08	16.83
Wild hay	6.88	7.20	7.20	8.10	8.10	7.60	8.63	7.20	8.40	6.63	7.59
Beans	.....	44.85	55.83	39.60	38.13	28.00	60.00	55.82	39.60	28.18	*43.32
Sug. Beets	.....	.....	72.00	105.00	70.87	86.13	93.71	67.71	72.75	††	†84.68

*Nine-year average—no data compiled for years prior to 1922. **Subject to revision. ††Price data for 1930 crop not available. †Five-year average (1924-28).

LIVESTOCK ESTIMATES FOR MONTANA AND THE UNITED STATES AS OF JANUARY 1, 1929, 1930 AND 1931

FOR MONTANA

Year	Species	Total Number	Value Per Head	Total Value
1931	Horses	446,000	$26.00	$11,758,000
1930	Horses	469,000	30.00	13,926,000
1929	Horses	515,000	31.06	15,996,000
1931	Mules	11,000	37.00	404,000
1930	Mules	11,000	45.00	494,000
1929	Mules	11,000	47.00	517,000
1931	All cattle	1,199,000	38.90	46,659,000
1930	All cattle	1,164,000	54.10	62,969,000
1929	All cattle	1,152,000	58.11	66,940,000
1931	Milk cows*	188,000	55.00	10,340,000
1929	Milk cows*	188,000	77.00	14,476,000
1930	Milk cows*	186,000	79.00	14,694,000
1931	All sheep	4,326,000	5.00	21,673,000
1930	All sheep	4,200,000	9.30	38,896,000
1929	All sheep	3,727,000	11.41	42,508,000
1931	Swine	272,000	12.40	3,379,000
1930	Swine	302,000	12.70	3,847,000
1929	Swine	328,000	13.12	4,303,000

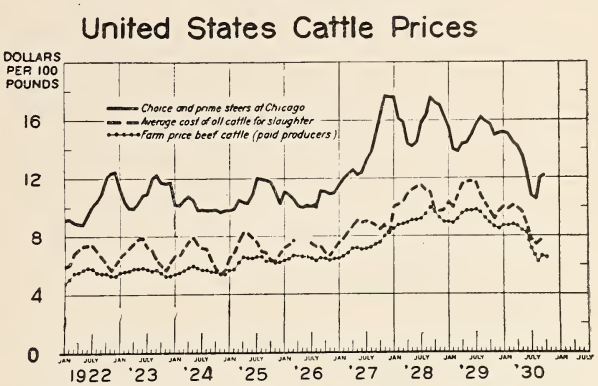
*Two years old and over, number included in all cattle item.

FOR THE UNITED STATES

Year	Species	Total Number	Value Per Head	Total Value
1931	Horses	12,803,000	$61.36	$ 785,624,000
1930	Horses	13,364,000	70.69	944,709,000
1929	Horses	13,897,000	70.11	974,290,000
1931	Mules	5,131,000	68.60	351,994,000
1930	Mules	5,279,000	82.97	438,019,000
1929	Mules	5,379,000	82.33	443,652,000
1931	All cattle	58,955,000	39.71	2,340,921,000
1930	All cattle	57,978,000	57.30	3,321,992,000
1929	All cattle	56,389,000	59.09	3,332,141,000
1931	Milk cows*	22,975,000	57.57	1,322,666,000
1930	Milk cows*	22,443,000	83.43	1,872,358,000
1929	Milk cows*	21,849,000	84.57	1,847,767,000
1931	All sheep	51,911,000	5.35	277,708,000
1930	All sheep	50,503,000	8.92	450,684,000
1929	All sheep	47,704,000	10.62	506,610,000
1931	All swine	52,323,000	11.66	610,200,000
1930	All swine	53,238,000	13.76	732,560,000
1929	All swine	57,410,000	13.05	749,373,000

*Two years old and over, number included in all cattle item.

CHANGES IN MONTANA'S CATTLE INDUSTRY DURING PAST 10 YEARS



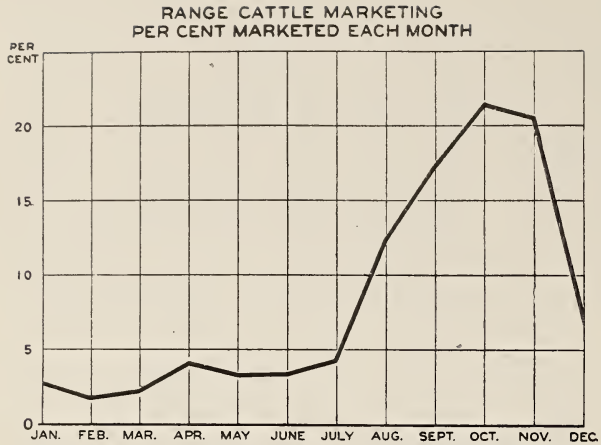
Farm prices of beef cattle follow the same trend as market prices, although they fluctuate less violently. The less violent fluctuation is explained in part by the fact that farm prices include prices of breeding stock which are more stable than the prices of other kinds of cattle. The seasonal regularity in the average cost of all cattle for slaughter is explained by the fairly regular seasonal variation in quantity and quality of cattle slaughtered during the year. (Data from Division of Crops and Livestock Estimates and Livestock, Meats and Wool Division.)

While total numbers of beef cattle in Montana show little net change during the past 10 years, there have been changes in practices and methods that have been significant. Although such changes were already taking place in the preceding decade, the past 10 years have witnessed almost a complete remodeling of the beef cattle industry as compared with practices and methods of the old order of cattle raising. Montana's cattle industry can now be said to be on a cow herd basis where once it was on a steer herd basis. In 1900 there were practically 100 steers for each 100 cows, as shown by the United States census; by 1910 there were about 70 steers per 100 head of cows; the census of 1920 showed 59 steers per 100 head of cows, and the census of 1925 showed but 33 steers per 100 cows. The 1930 census data is not available for similar classification although it is expected that it will show a relatively low proportion of steers to cows. The change from a steer herd to a cow herd basis has followed the practice of marketing a younger beef than formerly. During the years following the post-war deflation of beef prices the industry came more and more to a calf crop basis in marketing practices and the older steers decreased rapidly in both holdings of cattle and in marketings. Back in 1900 when production costs of growing out older steers were lower, the percentage of steers above two years in age to total steer numbers as shown by the census was 74 per cent. By 1920, the proportion had dropped to 48 per cent and by 1926, the proportion as indicated by sample holdings of stockmen in Montana had decreased to about 39 per cent. The annual marketings of Montana cattle as shown by the records of brand inspections made by the State Livestock Commission, reflect the decrease in steers in Montana marketings. These inspections during the past 10 years have been reported as follows:

CATTLE EXPORTS 1920-1930

Records of the Montana office of brand inspection show the following classification of Montana cattle exports as steers, cows, calves, and bulls for the period 1920 to 1930, inclusive.

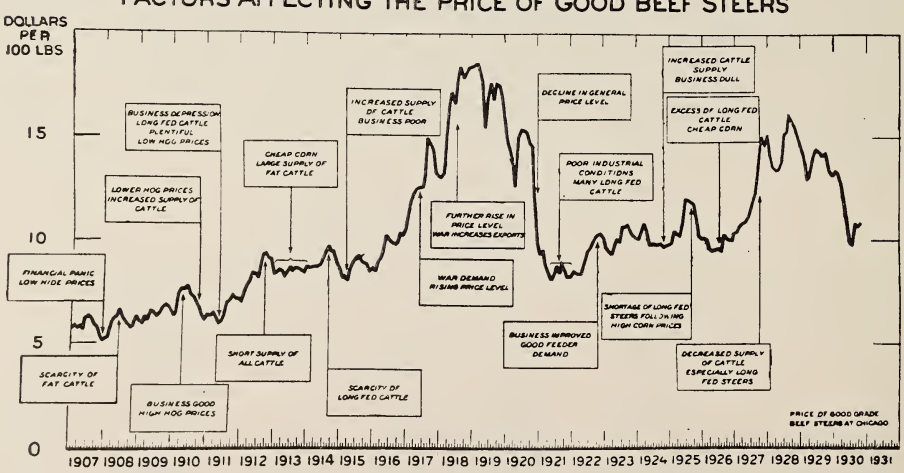
Year	Steers %	Cows %	Calves %	Bulls %	Total Head Classified	Total Exports (head)
1920	54.4	40.7	3.1	1.7	190,614	211,000
1921	78.5	16.9	3.4	1.2	111,739	147,000
1922	65.3	29.3	4.0	1.5	217,821	246,000
1923	55.0	37.2	6.0	2.0	258,040	343,000
1924	58.0	35.0	5.0	2.0	266,678	321,000
1925	51.4	41.1	5.7	1.7	335,408	407,000
1926	44.7	45.4	8.6	1.3	402,608	504,000
1927	52.2	41.9	4.5	1.4	254,755	330,000
1928	54.6	38.4	5.2	1.8	271,947	344,000
1929	53.3	38.0	7.1	1.6	267,299	329,000
1930	52.2	38.5	7.6	1.7	251,457	294,509



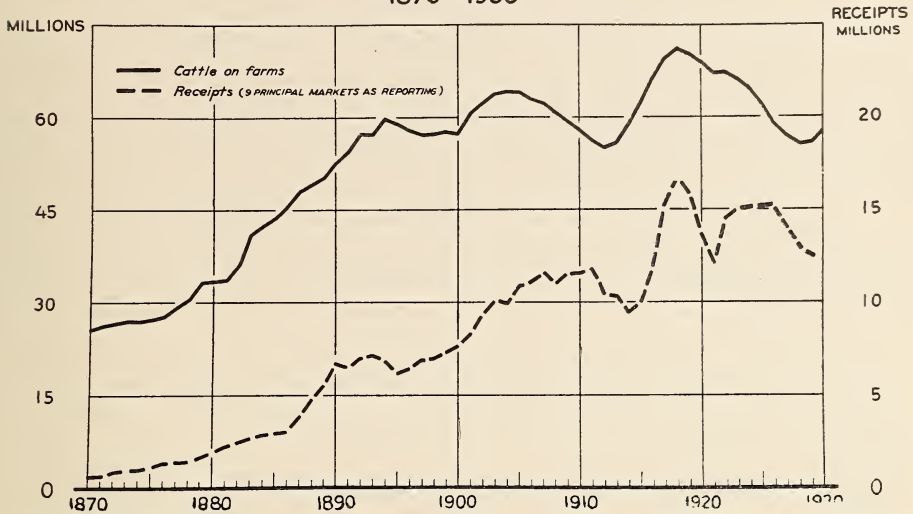
Most range cattle go to market in August, September, October and November. Market **before** or **after** this heavy movement when possible.

The past 10 years in cattle prices in Montana have seen relatively high prices for beef in contrast with relatively low prices. From 1920 to 1926, the industry was in a period of cattle prices when liquidation of holdings and increased marketings returned discouraging prices to growers. Following 1926, the year of largest national slaughter since 1918, a real scarcity of beef cattle resulted in strong prices during 1927, 1928 and 1929, which were the first years of prosperity to Montana cattle growers since the war days. Continued favorable conditions would probably have obtained in 1930, except for the world depression, which lowered cattle prices along with those of commodities generally. The year 1930, moreover, was a year of short feed and hay supplies due to the summer drought and followed a year when similarly poor feed conditions prevailed.

The decline in prices of slaughter steers in Chicago from December, 1929, to December, 1930, amounted to $2.00 for choice and prime grades; $2.40 for good grade; $2.65 for medium grade and $2.63 for common grade. During the same period stocker and feeder steer prices declined $2.50 and the decline in butcher cattle prices ranged from $2.25 to $3.50. The average price of slaughter cattle during 1930 was $8.54 compared with $10.59 in 1929, but remained above the low price of 1926, which was $7.32. The average price of calves in 1930, was $9.67 compared with $12.59 in 1929 and $9.83 in 1926.


FACTORS AFFECTING THE PRICE OF "GOOD" BEEF STEERS
DOLLARS PER 100 LBS
15
10
5
0
BUSINESS DEPRESSION LONG FED CATTLE PLENTIFUL LOW HOG PRICES
LOWER HOG PRICES INCREASED SUPPLY OF CATTLE
FINANCIAL PANIC LOW HIDE PRICES
SCARCITY OF FAT CATTLE
BUSINESS GOOD HIGH HOG PRICES
CHEAP CORN LARGE SUPPLY OF FAT CATTLE
SHORT SUPPLY OF ALL CATTLE
INCREASED SUPPLY OF CATTLE BUSINESS POOR
SCARCITY OF LONG FED CATTLE
FURTHER RISE IN PRICE LEVEL WAR INCREASES EXPORTS
WAR DEMAND RISING PRICE LEVEL
DECLINE IN GENERAL PRICE LEVEL
POOR INDUSTRIAL CONDITIONS MANY LONG FED CATTLE
SHORTAGE OF LONG FED STEERS FOLLOWING HIGH CORN PRICES
BUSINESS IMPROVED GOOD FEEDER DEMAND
INCREASED CATTLE SUPPLY BUSINESS DULL
EXCESS OF LONG FED CATTLE CHEAP CORN
DECREASED SUPPLY OF CATTLE ESPECIALLY LONG FED STEERS
PRICE OF GOOD GRADE BEEF STEERS AT CHICAGO
1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931

The principal factors regulating the price of beef steers are: (1) Market supplies of cattle. (2) The general price level. (3) Prices of competing meats. (4) The demand for stocker and feeder cattle. These casual factors are influenced by numerous other factors. Under unusual conditions, such as prevailed during the period of the World War, factors that are normally of minor importance may from time to time be a great influence in affecting price. (Data from "Crops and Markets" monthly.)



Since 1870 the trends in both the number of cattle on farms and cattle receipts at important markets have been upward. The last cycle in numbers of cattle started from a low point in 1912 and reached the peak about 1918. From 1918 to 1928 cattle numbers declined steadily, the number in 1928 being about the same as in 1912. A gradual increase in numbers has occurred since 1928. Receipts of cattle follow in general the same cycles as the number of cattle, except in times of unusual depression in the cattle business, such as took place during the period 1921 to 1926. (Data from Department Yearbook.)

From these comparisons is shown the fact that cattle prices did not decline as much relatively as did prices of many other agricultural products, which in some cases reached the lowest levels in 20 or more years. The price outlook for beef likewise is more promising than in case of many other farm products, in spite of the reduced consumer demand for beef that accompanies a depression. Although the first half of 1931 has not shown a very encouraging comparison with a year ago there are several reasons to expect that prices during the second half of the year will be more favorable. Among these are: (1) a marked scarcity of grain fed steers, (2) a better demand for feeding cattle as a result of the prospect of a much larger feed production in the corn belt as compared with 1930. A third reason for improvement may develop if industrial activity should increase in 1931, which would improve consumer demand for beef.

LIVESTOCK SHIPMENT DATA FOR 10 YEARS 1920-1929*

(Railway Commission data.)

Year	Number Cattle	Number Sheep	Number Swine
1920	283,000	1,046,000	15,000
1921	209,000	843,000	27,000
1922	357,000	968,000	59,000
1923	397,000	1,014,000	119,000
1924	376,000	1,033,000	197,000
1925	463,000	793,000	164,000
1926	508,000	1,342,000	126,000
1927	340,000	1,269,000	86,000
1928	380,000	1,429,000	180,000
1929	362,000	2,060,000	188,000

*Basis of crop season from March 31st to April 1st.
Figures rounded to nearest thousands.

THE TREND OF CATTLE POPULATION

Although cattle production is again increasing in the United States, it does not seem likely now that the expansion will be as great as that of the last period of expansion when war-time demands for beef resulted in an overproduction. Sheep numbers have expanded in the western states to a point where range and feed is not now available for any great expansion of cattle numbers, and although there may be some recession in sheep numbers in these states as a result of the present depression of the sheep industry, it is not likely that the liquidation of sheep holdings will reach the proportions of that which occurred between 1911 and 1916.

The principal expansion of cattle numbers is expected to come in the corn belt states, and particularly in the corn belt states west of the Mississippi, and while there is room for considerable expansion in this area, the trend of cattle prices in relationship to other prices rather than the potential capacity for cattle will be the factor to largely govern this expansion.

While cattle production has been increasing in the United States during the past three years, the increase has been greater in case of dairy cattle than in beef cattle. The sharp drop in cattle prices in 1930 has eliminated much of the price incentive to expand beef cattle numbers, although with the expected recovery of cattle prices the price factor may again operate. The general outlook for Montana cattle growers at this time is relatively favorable, especially as compared with other agricultural commodities, but cattlemen should carefully follow the yearly trends of cattle numbers and expect ultimately another peak when marketings of cattle will again be large and returns from cattle production unfavorable.

ESTIMATED CLASSIFICATION OF MONTANA CATTLE ON JANUARY 1, EACH YEAR FROM 1921 TO 1931

Year	Milk Cows 2 Years and Over	Beef Cows 2 Years and Over	All Heifers 1 Year and Under 2	All Steers 1 Year and Over	Bulls 1 Year and Over	Calves Under 1 Year	ALL CATTLE
1921	148,000	411,000	195,000	212,000	25,000	278,000	1,269,000
1922	155,000	383,000	228,000	242,000	27,000	345,000	1,380,000
1923	162,000	453,000	210,000	214,000	26,000	295,000	1,360,000
1924	174,000	394,000	231,000	166,000	26,000	369,000	1,360,000
1925	187,000	420,000	156,000	191,000	26,000	360,000	1,340,000
1926	190,000	410,000	145,000	139,000	25,000	371,000	1,280,000
1927	181,000	355,000	135,000	115,000	21,000	307,000	1,114,000
1928	177,000	355,000	135,000	115,000	21,000	311,000	1,114,000
1929	186,000	365,000	139,000	119,000	23,000	320,000	1,152,000
1930	188,000	369,000	141,000	121,000	23,000	322,000	1,164,000
1931	188,000	388,000	143,000	121,000	23,000	336,000	1,199,000

ESTIMATED LOSSES MONTANA CATTLE AND CALVES 1921-30

Year	Cattle (Number)	Calves (Number)	Total (Number)	Losses as Per Cent of All Cattle
1921	50,000	30,000	80,000	6.3
1922	67,000	49,000	116,000	8.4
1923	24,000	16,000	40,000	2.9
1924	27,000	18,000	45,000	3.3
1925	16,000	21,000	37,000	2.8
1926	18,000	23,000	41,000	3.2
1927	26,000	24,000	50,000	4.5
1928	19,000	18,000	37,000	3.3
1929	19,000	26,000	45,000	3.9
1930	20,000	24,000	44,000	3.8

MILK PRODUCTION

Montana has 188 000 milk cows of both dairy and beef breeds which supply the state with fluid milk and dairy products and produce a surplus of butter that is largely marketed on the west coast.

Cash income from milk, cream and butter fat sold by Montana farmers in 1930, was $10,177,000 or only about $3,500,000 less than the cash income from the poor wheat crop of that year. Income from milk cows on Montana farms has been growing rapidly in the past decade. From $7,735,000 in 1924, it has been as large as $12,812,000 in 1929, and was one of the items to show the least effect of the depression of farm prices in 1930.

The following report of the State Dairy Division shows the manufactured dairy products in 1930 compared with 1929 and the destination of Montana shipments of butter:

ESTIMATED CALF CROPS FOR MONTANA, 1921 TO 1930

Year		Number of Breeding Cows	Calf Crop as Per Cent of Cows	Number of Calves Raised
1921	Milk cows	148,000	84.0	124,000
	Beef cows	411,000	66.0	271,000
	All cows	559,000	70.7	395,000
1922	Milk cows	155,000	82.0	127,000
	Beef cows	383,000	64.0	245,000
	All cows	538,000	69.1	372,000
1923	Milk cows	162,000	83.0	134,000
	Beef cows	453,000	65.0	294,000
	All cows	615,000	69.6	428,000
1924	Milk cows	174,000	85.0	148,000
	Beef cows	394,000	65.0	256,000
	All cows	568,000	71.1	404,000
1925	Milk cows	187,000	84.0	157,000
	Beef cows	420,000	62.0	260,000
	All cows	607,000	68.9	417,000
1926	Milk cows	190,000	83.0	158,000
	Beef cows	410,000	65.0	266,000
	All cows	600,000	70.7	424,000
1927	Milk cows	181,000	81.0	147,000
	Beef cows	355,000	66.0	234,000
	All cows	536,000	71.1	381,000
1928	Milk cows	177,000	83.0	147,000
	Beef cows	355,000	68.0	241,000
	All cows	532,000	72.9	388,000
1929	Milk cows	186,000	85.0	158,000
	Beef cows	365,000	66.0	241,000
	All cows	551,000	72.4	399,000
1930	Milk cows	188,000	85.0	160,000
	Beef cows	369,000	68.0	251,000
	All cows	557,000	73.8	411,000

MONTANA DAIRY REPORT FOR 1930

(From Report of B. F. Thrailkill, Chief of Dairy Division)

Following is the monthly production of butter, ice cream, and cheese in Montana for 1930 as compared with the same period in 1929:

	BUTTER		ICE CREAM		CHEESE	
	1930 (lbs.)	1929 (lbs.)	1930 (gals.)	1929 (gals.)	1930 (lbs.)	1929 (lbs.)
January	937,443	1,000,962	26,647	28,579	113,706	168,161
February	923,740	960,360	40,535	32,150	103,888	147,197
March	964,400	1,034,389	44,926	50,751	136,175	162,428
April	1,141,596	1,123,811	74,519	64,614	148,504	172,708
May	1,998,637	1,534,011	91,028	98,900	208,181	230,645
June	2,127,531	2,139,998	120,245	134,812	215,521	194,407
July	1,986,682	2,195,030	158,578	190,690	195,555	160,329
August	1,731,916	1,826,423	137,184	179,054	136,397	163,329
September	1,550,158	1,468,122	66,936	78,975	110,611	136,761
October	1,482,832	1,423,744	39,418	59,867	91,507	137,113
November	1,003,379	1,023,555	32,699	38,383	78,626	110,818
December	943,346	954,032	30,441	33,519	73,273	109,598
Totals	16,791,660	16,684,437	863,156	990,294	1,611,944	1,893,494

During 1930, 416,584 lbs. of dried milk and 143,215 lbs. of casein were manufactured. Oleomargarine sales during 1930 amounted to 340,703 lbs. as compared with 196,882 lbs. in 1929.

KEY TO ZONES

Zone 1. Lincoln, Flathead, Sanders, Lake, Mineral, Missoula and Ravalli.

Zone 2. Granite, Powell, Lewis and Clark, Deer Lodge, Jefferson, Madison, Silver Bow, Beaverhead counties.

Zone 3. Glacier, Toole, Liberty, Hill, Blaine, Phillips, Pondera, Teton, Cascade and Chouteau counties.

Zone 4. Fergus, Judith Basin, Musselshell, Golden Valley, Wheatland and Petroleum counties.

Zone 5. Meagher, Broadwater, Gallatin, Park and Sweet Grass counties.

Zone 6. Stillwater, Carbon, Yellowstone, Big Horn and Treasure counties.

Zone 7. Rosebud, Custer, Fallon, Carter and Powder River counties.

Zone 8. Valley, Daniels, Sheridan, Roosevelt, Garfield, McCone, Richland, Dawson, Prairie and Wibaux counties.

PRODUCTION FIGURES BY ZONES:

BUTTER

	1930	1929	1928	1927
Zone 1	3,275,859	3,123,187	2,852,718	2,996,462
Zone 2	2,926,177	2,989,924	3,090,490	3,276,780
Zone 3	3,108,534	3,077,701	2,979,642	3,351,268
Zone 4	1,459,440	1,494,341	1,610,147	1,569,992
Zone 5	1,288,387	1,235,129	1,219,932	1,408,677
Zone 6	2,583,353	2,323,551	2,089,981	1,912,264
Zone 7	1,769,956	2,162,724	2,334,663	2,008,355
Zone 8	379,954	277,880	185,777	177,435
Totals	16,791,660	16,684,437	16,363,350	16,701,233

ICE CREAM

	1930	1929	1928	1927
Zone 1	119,631	128,409	111,743	99,962
Zone 2	222,861	282,963	262,742	225,289
Zone 3	222,749	257,687	225,878	167,415
Zone 4	40,800	51,715	54,002	48,368
Zone 5	55,653	58,381	60,493	45,313
Zone 6	111,374	112,510	100,055	75,177
Zone 7	43,226	48,529	47,351	38,167
Zone 8	46,862	50,100	46,202	41,084
Totals	863.156	990,294	908,466	740,775

CHEESE

	1930	1929	1928	1927
Zone 1	927,479	1,229,725	1,714,782	1,202,493
Zone 2	170,395	227,348	186,457	88,237
Zone 3	.....	.....	.....	.....
Zone 4	38,168	45,785	49,930	.....
Zone 5	206,267	258,109	293,297	208,361
Zone 6	269,635	132,527	102,451	57,968
Zone 7	.....	.....	.....	.....
Zone 8	.....	.....	.....	.....
Totals	1,611,944	1,893,494	2,346,917	1,557,059

BUTTERFAT SHIPPED OUT OF STATE

	1930	1929
From Zone 1	70,138	116,391
From Zone 3	52,583	74,525
From Zone 6	49,524	53,190
From Zone 7	29,745	54,229
From Zone 8	588,807	788,872
Totals	790,797	1,087,207

BUTTER SHIPPED OUT OF STATE BY CREAMERIES

	1930	1929	1928
California	2,993,410	2,767,091	3,429,018
Washington	2,330,130	2,691,182	1,985,360
Idaho	360,066	358,050	84,696
Illinois	470,310	205,528	201,565
Indiana	66,504	21,376	.....
Massachusetts	133,407	75,953	.....
Minnesota	323,669	209,314	133,761
North Dakota	18,892	26,486	11,359
New York	214,335	443,907	325,649
Ohio	67,116	256	.....
Oregon	27,268	66,980	.....
Pennsylvania	.....	5,664	.....
Tennessee	.....	1,440	.....
South Dakota	.....	2,616	8,317
Wyoming	31,446	31,471	54,327
Maine	1,088	21,344	.....
Colorado	960	448	.....
Iowa	22,480	324	7,424
Michigan	21,896	.....	.....
Totals	7,082,977	6,929,430	6,241,476

CENSUS NUMBERS OF LIVESTOCK

District and County	ALL CATTLE 1930	ALL CATTLE 1920	MILK CATTLE 1930	MILK CATTLE 1920
NORTHWESTERN				
Deer Lodge	4,743	3,654	1,030	750
Flathead	11,800	2,030	3,886	4,248
Granite	12,382	15,357	1,201	1,124
Lake	18,775	.....	5,758	.....
Lincoln	4,408	3,426	1,171	714
Mineral	741	844	265	218
Missoula	10,802	18,295	2,688	3,843
Powell	20,347	20,214	2,137	1,935
Ravalli	21,230	21,390	7,742	5,485
Sanders	13,865	8,470	2,762	1,039
NORTH-CENTRAL				
Blaine	32,823	28,434	2,975	2,548
Chouteau	41,718	26,466	3,167	4,159
Glacier	5,662	27,536	655	351
Hill	19,116	14,225	3,291	3,657
Liberty	10,044	6,080	957	792
Phillips	31,190	33,931	3,027	2,891
Pondera	14,664	10,776	3,283	1,746
Teton	24,918	18,249	2,777	2,319
Toole	14,069	8,106	1,444	949
NORTHEASTERN				
Daniels	8,096	.....	2,157	.....
Dawson	18,779	20,358	3,231	1,397
Garfield	22,918	31,415	1,525	1,220
McCone	13,034	20,426	2,122	1,519
Richland	18,796	23,978	3,750	3,143
Roosevelt	13,530	17,533	2,906	2,518
Sheridan	15,940	25,454	4,474	7,426
Valley	21,544	25,087	3,731	3,061
CENTRAL				
Broadwater	13,240	15,867	1,445	1,245
Cascade	39,154	44,170	5,928	5,136
Fergus	47,761	77,299	7,104	9,662
Golden Valley	10,312	.....	1,357	.....
Judith Basin	24,338	.....	2,245	.....
Lewis and Clark	24,956	33,422	2,819	2,674
Meagher	18,343	24,476	1,035	954
Musselshell	12,822	30,024	1,507	4,414
Petroleum	9,896	.....	1,166	.....
Wheatland	14,502	24,792	1,287	1,643
SOUTHWESTERN				
Beaverhead	70,566	80,676	1,782	1,413
Gallatin	28,671	35,635	6,206	3,532
Jefferson	11,879	19,270	2,226	2,264
Madison	28,279	42,713	3,102	2,520
Silver Bow	4,709	5,670	1,549	1,867
SOUTH-CENTRAL				
Big Horn	40,384	55,551	2,624	1,279
Carbon	20,237	27,152	5,205	3,545
Park	21,465	25,515	2,647	2,664
Stillwater	21,977	21,419	3,907	3,044
Sweet Grass	22,704	23,859	2,580	1,898
Treasure	8,184	7,161	738	741
Yellowstone	19,975	31,217	5,659	6,000
SOUTHEASTERN				
Carter	30,233	17,560	1,196	716
Custer	40,696	30,476	1,763	1,669
Fallon	16,125	15,374	2,567	2,031
Powder River	44,554	51,548	1,857	359
Prairie	13,078	15,506	1,747	1,321
Rosebud	31,189	51,599	2,588	1,981
Wibaux	8,268	10,560	2,151	2,052
State Totals	1,144,431	1,268,516	152,099	127,581

NOTE: 1930 census figures are preliminary.

THE SHEEP CYCLE IN MONTANA

Montana sheep and wool prices in 1930 declined to the lowest levels since 1915, for sheep, and since 1921, for wool. The January 1, 1931, average price of all sheep and lambs in Montana was reported at $4.95, compared with $9.30 a year ago; and $11.30 two years ago. The highest average price since 1912, was $12.60 per head, in 1918, and the lowest, $3.30, in 1912. The average price of the 1930 wool clip as indicated by the July, 1930, Montana price was 21 cents, compared with 29 cents in July, 1929, and 38 cents in July, 1928. Since 1910, the lowest July wool price in Montana was 16 cents, in 1913, and the highest, 57 cents, in 1918.

SUPPLY AND DEMAND

Many factors enter into the prices of Montana sheep and wool, but the more important factors are the production of sheep and wool in the United States; the demand for these commodities and the competition of substitutes. The demand for lamb and wool are in turn affected by business activity and to a large extent by the prices of substitutes.

In the final analysis, however, supply and demand largely govern the prices of sheep and wool as is the case with all economic goods.

HIGH AND LOW PRICE CYCLES

The course of sheep and wool prices from year to year in Montana, since records are available back to 1912, disclose the fact that there have been two major periods of relatively high prices and two major periods of relatively low prices. The same situation of course is true for national prices of sheep and wool. The periods of high prices occurred during the war period of 1915 to 1919, and during the period 1923 to 1929. The periods of low prices were the periods of 1920 to 1922, and the present one which began in 1930.

DISPOSITION MONTANA SHEEP AND LAMBS

Year	1*	2		3**		4
		Losses			Fall Movement	
	Total Supply	†Sheep	‡Lambs	Farm Slaughter	To Market	Other Fall Shipments	Total Calendar Year Markets
	(000)	(000)	(000)	(000)	(000)	(000)	(000)
1920	.....	180	.....	62	469	355	913
1921	.....	100	.....	60	391	180	760
1922	3,839	282	72	60	293	675	1,085
1923	3,641	144	52	61	361	465	920
1924	3,872	143	113	63	244	602	1,019
1925	4,083	150	94	63	247	709	1,077
1926	4,439	220	229	64	448	768	1,378
1927	4,621	230	88	68	330	808	1,301
1928	5,239	210	99	69	506	883	1,441
1929	5,794	147	112	68	630	873	1,628
1930	6,707	150	62	75	817	960	2,074

*January 1 number plus lambs raised.
** Shipments September to December.
†Estimated from reported percentage lost times total January 1 number each year.
‡Difference between lambs docked and lambs raised.
NOTE: All numbers in above table shown as thousands with (000) head omitted.

PRICES, STOCK SHEEP, AND SLAUGHTER

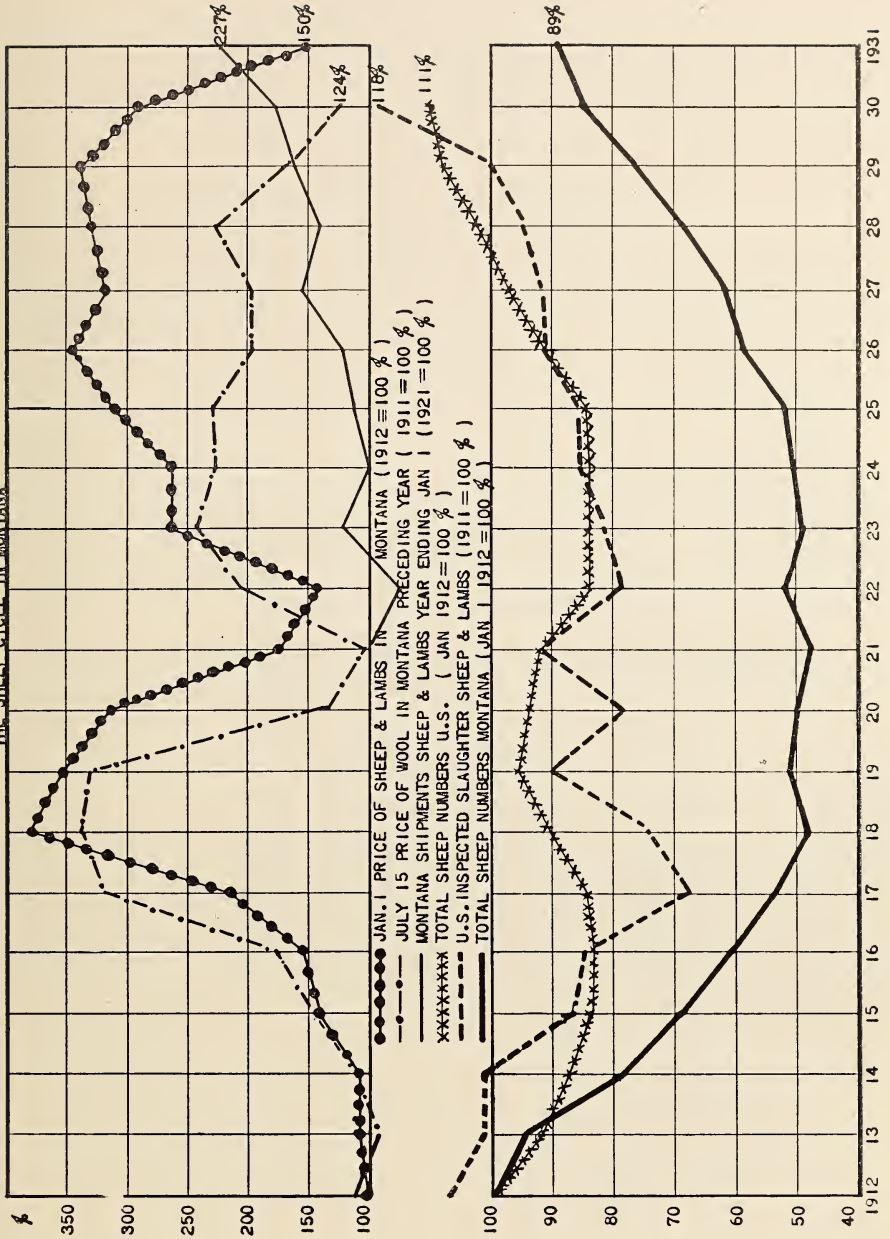
While the first period of high prices was in progress, sheep slaughter in the United States as indicated by the annual inspected slaughter was declining and sheep numbers in the United States were increasing. Toward the close of the war in 1919, sheep numbers in the United States began to decline and slaughter sharply increased, reaching a relatively high point in 1921, which year marked the low point reached by wool prices, and the following year saw the decline stopped in sheep prices. Both slaughtered and total sheep numbers reached low points in 1922, which was the beginning of the second period of relatively high prices for sheep and wool. This second period was marked by a steadily increasing sheep population in the United States with the increase becoming quite rapid after 1926. Slaughter during this period likewise increased, but was not sufficient to check the annual growth of total sheep numbers. Montana sheep prices began their second period of increase in 1922 and reached their highest post-war peak in 1926. From this point they wavered, but came back to a second high peak in 1929, from which point the drop of the past two years has been about as precipitous as that which followed the close of the world war.

UNITED STATES: TOTAL SHEEP, VALUE PER HEAD, INSPECTED SLAUGHTER AND PER CAPITA CONSUMPTION OF MUTTON AND LAMB

Year	Total Sheep and Lambs January 1	Average Value Per Head of Sheep*	United States Inspected Slaughter Jan.-Dec.	Annual Per Capita Consumption of Lamb and Mutton (pounds)
1907	44,518,000	$3.84	10,252,000	6.4
1908	46,557,000	3.88	10,305,000	6.2
1909	48,382,000	3.43	11,343,000	6.6
1910	47,072,000	4.12	11,408,000	6.5
1911	47,349,000	3.91	14,020,000	7.8
1912	43,279,000	3.46	14,979,000	8.2
1913	40,706,000	3.94	14,406,000	7.6
1914	37,773,000	4.02	14,229,000	7.5
1915	36,287,000	4.50	12,212,000	6.4
1916	36,543,000	5.17	11,941,000	6.2
1917	36,700,000	7.13	9,345,000	4.6
1918	39,000,000	11.82	10,320,000	4.7
1919	41,000,000	11.63	12,691,000	5.8
1920	40,243,000	10.46	10,982,000	5.0
1921	38,690,000	6.28	13,005,000	6.2
1922	36,186,000	4.80	10,929,000	5.0
1923	36,212,000	7.53	11,520,000	5.2
1924	36,876,000	7.91	11,991,000	5.1
1925	38,112,000	9.70	12,001,000	5.3
1926	39,730,000	10.51	12,961,000	5.5
1927	41,881,000	9.71	12,882,000	5.4
1928	44,554,000	10.25	13,488,000	5.6
1929	47,704,000	10.62	14,023,000	.....
1930	50,503,000	8.92	16,600,000†	.....
1931	51,911,000	5.35	.....	.....

*Sheep and lambs January 1.
†An estimate based on slaughter of first 10 months of year.

NOTE: In reading the graph on the sheep cycle please note that the yearly data is charted as a percentage of a base year in each case. This permits a general comparison of the trends of data like numbers of head and prices per head which could not be readily made if expressed in original units. Notes on the graph show the base year for each curve.



SPECULATION IN BREEDING STOCK

An interesting comparison is shown between the course of sheep and wool prices in Montana during the period 1922 to 1929. Unlike the period of 1915 to 1919, wool prices did not parallel the trend of sheep prices. Instead, wool prices declined irregularly from 1923 to 1927, during which time sheep prices were making a sharp rise. After a slight rise in 1928, wool prices began their present

decline, or a year earlier than did sheep. The apparent explanation for sheep prices continuing to rise in face of receding prices for wool is that of the expansion program of sheepmen themselves, which held back large numbers of ewe lambs from slaughter and added them yearly to stock sheep numbers. Not until 1930, did slaughter rise to a point where the rapid expansion of total sheep numbers was checked.

BIG MARKETINGS AT LOW PRICES

Montana's annual marketings of sheep and lambs from records available back to 1920, show a gradual upward trend since that time. However, the heaviest shipments came after the break in prices in 1929, with peak shipments going at the low 1930 prices. What happened in Montana during the war period of high prices is not known due to inadequacy of marketing records prior to 1920. However, the trend of sheep numbers in the state was sharply downward during that period which may indicate that Montana sheepmen liquidated rather strongly on that rising market.

Montana sheep numbers since 1912 show that the industry was declining at a rapid rate up to 1921, whereas, sheep numbers in the United States increased rather sharply between 1915 and 1919. Montana sheepmen expanded their holdings strongly after peak prices were reached in 1926, but most of this expansion has come at a time when sheep prices were declining. Present numbers of sheep in Montana are at the highest peak since 1913, and present sheep prices are at the lowest level since that time.

ESTIMATED MONTANA LAMB PRODUCTION 1920-1930

Year	1 All Sheep and Lambs January 1	2 Breeding Ewes 1 and Over January 1	3 Lambs Docked % Bred Ewes Jan. 1	3 Lambs Docked Number	4 Lambs Raised % Bred Ewes Jan. 1	4 Lambs Raised Number
1920	2,450,000	1,726,000	....	.....	....	.....
1921	2,328,000	1,541,000	....	.....	....	.....
1922	2,561,000	1,800,000	75	1,350,000	71†	1,278,000
1923	2,408,000	1,761,000	73	1,285,000	70†	1,233,000
1924	2,480,000	1,881,000	80	1,505,000	74	1,392,000
1925	2,579,000	1,880,000	85	1,598,000	80	1,504,000
1926	2,880,000	2,079,000	86	1,788,000	75	1,559,000
1927	3,053,000	2,208,000	75	1,656,000	71	1,568,000
1928	3,358,000	2,475,000	80	1,980,000	76	1,881,000
1929	3,727,000	2,794,000	78	2,179,000	74	2,067,000
1930	4,200,000	3,095,000*	83*	2,569,000*	81	*2,507,000
1931	4,386,000	3,450,000	....	.....	....	.....

†Approximations.
*Tentative revision January 21, 1931.

ESTIMATED MONTANA ANNUAL LAMB SUPPLIES*

Year	Lambs Raised (000)	Early Lamb Shipments (000)	Lambs Held Ewes (000)	Lambs Held Other (000)	Lambs on Feed January 1 (000)	Fall Movement Lambs (000)	Fall Movement Others (000)	Total Fall (000)
1920	.....	.....	.....	.....	.....	.....	.....	824
1921	.....	.....	.....	.....	.....	.....	.....	571
1922	1,278	.....	.....	.....	.....	.....	.....	968
1923	1,233	20	.....	.....	99	.....	.....	836
1924	1,392	17	.....	.....	100	.....	.....	846
1925	1,504	16	593	17	105	.....	.....	994
1926	1,559	65	662	12	110	869	231	1,100
1927	1,568	34	700	14	100	737	207	944
1928	1,881	26	800	15	96	900	250	1,150
1929	2,067	45	634	15	160	1,150	275	1,425
1930	2,507	50	464	25	190	1,580	300	1,880

*Crop year begins May 1 each year.
NOTE: In above table numbers are shown in (000) head.

MONTANA ANNUAL WOOL PRODUCTION

Year	Sheep Shorn Number of Fleeces	Weight Per Fleece	Total Wool Shorn	Cars of Wool Shipped	Montana July 15 Price of Wool (cents)
1920	2,100,000	8.0	16,800,000	568	23
1921	2,030,000	8.4	17,052,000	627	18
1922	2,267,000	8.4	19,043,000	560	36
1923	2,206,000	8.5	18,751,000	582	41
1924	2,270,000	8.6	19,522,000	591	39
1925	2,400,000	8.6	20,640,000	671	39
1926	2,650,000	8.8	23,320,000	753	33
1927	2,810,000	8.6	24,166,000	791	33
1928	3,096,000	8.6	26,626,000	865	38
1929	3,653,000	8.6	31,415,000*	1,019	29
1930	3,649,000	9.0	32,840,000*	995†	21

*Revised January 1, 1931.
†Through November, 1930.

IMPORTANCE OF SHEEPMEN'S ECONOMIC INFORMATION

Recent developments in the sheep industry have but served to emphasize the fact that, although often remote from the business world and at times on the fringe of civilization itself, the sheepman must keep himself informed. As the radio man would say, everyone knows that the sheepman must face competition, not only with wool growers in other parts of the world, but also with other meats for a place on the diet, and with producers of other livestock for land, labor and all the machinery of production. He must expect also the recurring periods of high and low business activity which affect the demand for his product.

Times such as the present, find large increases in sheep marketed and reduced demand for wool. Later, however, when supplies of wool and of mutton become low, prices rise again, and the same cycle of increased production will be re-enacted.

LOOKING AHEAD

Benjamin Franklin said he knew of no better way of judging the future than by the past. There may be newer ways, involving the intricate relationships of all things and all people, but the element of past experience is still vital in all appraisals of future prospects. Sheepmen already know from past experience that the present depression of sheep and wool prices will undoubtedly give way to more prosperous times with higher prices, but it is difficult to determine the exact turn in the road ahead. The course of sheep and wool prices in the past shows a high relationship between the two; this is to be expected because the value of the wool is part of the value of a sheep carcass. Wool prices help make sheep prices, but sheep prices do not necessarily help wool prices as is shown during the trends of the two during the past seven years.

Both sheep and wool prices are sensitive to general business conditions and in general wool prices during the past 100 years have tended to follow the trend of the general price level. Sheep and lamb prices, however, would seem to anticipate rather than follow fluctuations in general trade conditions. In 1894 the prices of sheep and lambs reached a low point that general commodity prices did not reach until two years later, in 1896. In 1918, sheep and lambs recorded high prices that general commodities did not reach until 1920.

If these two instances are sufficient basis on which to judge present prices of sheep and lambs it might be expected that sheep and lamb prices have already discounted the general commodity price decline. Furthermore, if the general business conditions improve in 1931, and are accompanied by their past effect upon wool prices it would be reasonable to expect that lamb and sheep prices might also improve.

On the other hand, total sheep numbers in the United States have not reduced sufficiently to warrant the belief that market supplies and slaughter will be materially smaller in 1931 despite the large slaughter of 1930. Liquidation of sheep in weak hands that was withheld because of the low 1930 prices may

in many cases take place in 1931, and tend to hold down any material price changes. Finally, business revival may be delayed longer than now expected and operate as a dampener upon any improvement in 1931 wool prices.

Summing up these various relationships there would not appear to be much hope for any material improvement in 1931 sheep prices over those of 1930, especially for the period over which the bulk of the marketing takes place. However, there is also the likelihood that 1931 prices will not reach lower levels than in 1930, considering the severity of the 1930 decline. The price decline in sheep and lambs following the war, while covering a period of four years from 1918 to 1922, was not precipitous until the last two years of this period. The present price decline apparently began in 1926, but was turned upward again in 1927 and 1928 by relatively high industrial activity. The drop in 1929 and 1930, however, was fully as precipitous and covered a slightly greater distance than that of 1920 to 1922.

PRESENT SHEEP NUMBERS IN MONTANA

The total numbers of sheep and lambs in Montana on January 1, 1931, was 4,386,000 head, or the largest since 1913, when they were 4 675,000 head. The average value of the 1931 inventory per head was $4.95 compared with $3.70 in 1913. During the period 1913 to 1931 the highest January 1, value per head was in 1918 when it was $12.60, and at the time Montana's sheep population was but 2,380,000 head, or the second lowest number in the 20-year period.

In the present sheep population of Montana the number of ewes one year old and over is 3,450,000 head, or the highest point in the past 10 years. The present number of ewe lambs that were retained from the 1930 lamb crop for breeding stock is 655,000 head, or the smallest since 1927.

Compared with a year ago present numbers of breeding ewes are about 11 per cent larger which with other things being equal would point to a similar increase in the 1931 lamb crop in Montana.

From these comparisons it is evident that the 1930 drop in sheep and wool prices will probably not operate to reduce lamb production in Montana in 1931, although now indicating curtailment in 1932.

Present sheep numbers with other things being equal, also would seem to indicate a 1931 wool clip in Montana as large if not slightly larger than that of 1930.

PRESENT SHEEP NUMBERS IN THE UNITED STATES

January 1, 1931, numbers of sheep and lambs in the United States were estimated to be 51,911,000 head or 2.8 per cent larger than a year ago. Present numbers are now larger than at any time in the past 23 years. However, the gain in stock sheep in the United States was much smaller than the trend since 1925, and the increase from January 1, 1929, to January 1, 1930.

It would seem now that 1931 will see a recession in total sheep numbers in the United States. At any rate a slaughter in 1931 as large as that in 1930 would probably result in some reduction.

HORSES AND MULES

Horse numbers in Montana continue to decline in face of competition of the tractor and automobile. Horse raising as an industry, once a ranch enterprise in Montana, has almost disappeared and most of the breeding today is merely for replacement of work stock. Nevertheless, horses still contribute some share of the annual agricultural income with something in the neighborhood of a million dollars coming from this item in 1929. Unclaimed horses on Montana ranges in recent years have been rounded up and shipped to canning factories where Old Dobbin is made palatable for certain classes of foreign consumers. Mules in Montana have never been taken seriously as work stock. The present total number in the state being less than 10,000 head.

CENSUS NUMBERS OF LIVESTOCK

District and County	HORSES 1930	HORSES 1920	MULES 1930	MULES 1920
NORTHWESTERN				
Deer Lodge	1,260	1,437	3	3
Flathead	4,936	10,979	90	126
Granite	2,256	5,837	66	102
Lake	5,966	.....	110	.....
Lincoln	1,349	1,469	20	9
Mineral	298	384	13	3
Missoula	3,000	9,336	138	141
Powell	4,635	6,390	46	60
Ravalli	5,175	7,814	171	155
Sanders	3,576	3,681	68	27
NORTH-CENTRAL				
Blaine	14,696	21,677	140	117
Chouteau	11,669	23,243	202	563
Glacier	7,602	6,033	25	6
Hill	9,329	18,503	66	215
Liberty	3,920	5,391	59	34
Phillips	19,628	29,585	243	201
Pondera	7,313	11,213	102	278
Teton	6,603	11,226	108	192
Toole	5,192	9,062	42	49
NORTHEASTERN				
Daniels	6,955	.....	138	.....
Dawson	12,028	20,046	187	81
Garfield	15,664	22,129	108	149
McCone	11,730	19,316	119	153
Richland	13,216	23,863	228	100
Roosevelt	11,195	16,003	112	111
Sheridan	10,169	27,343	196	253
Valley	15,350	25,930	284	317
CENTRAL				
Broadwater	3,333	5,192	272	238
Cascade	8,785	15,786	263	363
Fergus	18,077	41,855	430	1,060
Golden Valley	3,903	.....	74	.....
Judith Basin	5,462	.....	109	.....
Lewis and Clark	4,896	7,607	181	132
Meagher	3,778	6,010	50	63
Musselshell	5,384	17,794	97	459
Petroleum	6,427	.....	64	.....
Wheatland	3,587	6,713	125	249
SOUTHWESTERN				
Beaverhead	15,733	19,094	281	197
Gallatin	10,321	16,782	237	377
Jefferson	2,537	5,693	69	64
Madison	8,774	12,295	190	52
Silver Bow	784	2,200	44	34
SOUTH-CENTRAL				
Big Horn	11,180	11,576	192	182
Carbon	8,378	14,044	234	252
Park	6,147	8,002	154	121
Stillwater	7,321	10,321	377	762
Sweet Grass	4,660	6,737	269	274
Treasure	2,984	4,076	150	28
Yellowstone	12,126	18,737	379	427
SOUTHEASTERN				
Carter	10,830	10,827	196	78
Custer	14,013	18,601	111	159
Fallon	7,308	11,611	103	60
Powder River	11,658	14,234	256	46
Prairie	7,008	11,473	67	73
Rosebud	19,327	24,702	180	178
Wibaux	4,513	8,071	24	89
State Totals	443,944	668,723	8,262	9,462

NOTE: 1930 census figures are preliminary.

POULTRY IN MONTANA

Poultry in Montana has been increasing its contribution to farm income steadily during the past decade. Cash income from chickens sold in 1924 was about $634,000 and from eggs $2,397,000. By 1929 chicken income had increased to $840,000 and cash income from eggs to $3,308,000. Allowing for the consumption of both eggs and chickens on farms where produced the gross income from chickens in 1929 was $1,948,000 and from eggs $4,950,000. Montana has yet relatively few commercial chicken growers although there has been some increase in such farms in the past 10 years. The bulk of the chicken and egg production is from farm flocks.

TURKEYS

Turkey production in Montana despite yearly swings has recorded a steady growth in the past 10 years. Due to the in-and-outers in turkey production which characterizes new agricultural enterprises it has been difficult to secure satisfactory statistics on turkey production. Much of Montana's turkey crop is shipped out of the state through local pools of growers. The extension service of the agricultural college has done much in recent years to encourage turkey production, since it has been discovered that despite long hauls to markets, Montana turkeys have been profitably handled and are known as being of high quality.

Estimates of the State Division of Publicity indicate that over a million pounds of turkeys were marketed by Montana growers during the year 1930 with cash returns of $300,000. About 85 per cent of the sales were made through cooperative associations and shipped largely to eastern markets. Shipments through these pools aggregated 880,480 pounds. Local marketings were placed at 166,220 pounds bringing the total farm sales to 1,046,680 pounds. Prices to growers for Thanksgiving markets ranged from 17½ to 29 cents per pound; for the Christmas markets from 22 to 30½ cents and for those sold in January and February the range was from 22 to 36 cents.

SWINE

Hog numbers in Montana have gained materially during the past 10 years until income from hogs annually is fifth among cash income sources in the livestock and livestock products group. In 1921 the January 1 inventory of stock hogs was 160,000. The highest point of the past 10 years was reached in January, 1929, when the number of stock hogs was 328,000 head. A downward swing in numbers since that time has carried the January, 1931, inventory to 272,000 head.

Hog production in Montana in 1930 was not as profitable as in 1929, due to lower market prices. Production of pigs was smaller than in 1929 as a result of fewer sows being bred for both spring and fall crops. The average litters, however, were slightly better and losses of both pigs and sows were lighter. Shipments were about 58,000 head smaller in 1930 than in 1929, being placed at 130,000 head in 1930, compared with 188,000 head for the preceding year. Farm and local slaughter in 1930 was 220,000 head, or nearly the same as in 1929, when it was 224,000 head.

Following a decline in hog production in Montana in 1930, Montana farmers indicated by their breeding intentions last fall that they will increase hog production again in 1931. This survey shows that they planned to breed about 42 per cent more sows for spring pigs in 1931 than were farrowed in the spring of 1930. Allowance for some failure to fully carry out fall intentions would still indicate a considerable expansion of the industry in 1931.

CENSUS NUMBERS OF LIVESTOCK

County and District	SWINE 1930	SWINE 1920	CHICKENS 1930	CHICKENS 1920
NORTHWESTERN				
Deer Lodge	1,155	1,410	16,994	11,883
Flathead	2,641	4,386	59,662	70,942
Granite	527	878	11,149	11,883
Lake	5,181	.....	48,774	.....
Lincoln	588	782	15,796	10,172
Mineral	114	327	3,335	3,485
Missoula	1,745	5,535	36,124	60,784
Powell	1,086	1,951	28,399	25,086
Ravalli	4,509	10,386	54,283	59,217
Sanders	770	1,385	25,359	20,385
NORTH-CENTRAL				
Blaine	3,143	1,677	50,158	41,790
Chouteau	3,654	3,246	69,880	73,471
Glacier	415	136	9,422	4,659
Hill	2,692	1,772	57,422	53,763
Liberty	492	399	15,303	10,905
Phillips	2,304	1,735	49,724	47,171
Pondera	2,424	1,908	43,640	34,497
Teton	1,846	2,002	49,840	34,079
Toole	986	815	22,576	15,756
NORTHEASTERN				
Daniels	2,117	.....	30,103	.....
Dawson	2,196	2,214	53,940	42,822
Garfield	1,644	1,460	32,466	33,228
McCone	1,085	1,676	38,725	36,917
Richland	4,281	3,978	60,728	57,003
Roosevelt	2,760	2,595	42,613	36,578
Sheridan	2,945	4,360	55,826	84,334
Valley	2,639	2,680	57,006	59,562
CENTRAL				
Broadwater	1,826	2,853	18,887	22,230
Cascade	3,754	6,367	89,754	77,640
Fergus	6,567	11,089	95,365	166,190
Golden Valley	782	.....	22,415	.....
Judith Basin	2,120	.....	31,647	.....
Lewis and Clark	2,207	3,378	34,277	33,394
Meagher	946	1,575	10,788	12,953
Musselshell	1,107	4,309	25,554	63,029
Petroleum	960	.....	14,696	.....
Wheatland	824	2,486	14,983	28,835
SOUTHWESTERN				
Beaverhead	4,695	2,558	23,397	25,047
Gallatin	6,633	11,504	83,518	82,143
Jefferson	1,018	2,215	19,584	22,928
Madison	3,368	7,111	43,032	47,110
Silver Bow	295	1,375	8,153	11,018
SOUTH-CENTRAL				
Big Horn	3,851	2,885	36,259	27,557
Carbon	3,695	8,707	58,659	66,602
Park	3,404	6,402	28,581	35,327
Stillwater	4,185	5,381	55,416	64,834
Sweet Grass	1,391	3,869	21,249	34,063
Treasure	519	1,196	11,264	12,874
Yellowstone	4,112	9,566	103,038	109,932
SOUTHEASTERN				
Carter	4,355	1,004	32,642	16,584
Custer	1,625	1,947	34,489	27,914
Fallon	3,576	1,363	37,037	26,240
Powder River	5,007	1,961	34,228	19,840
Prairie	1,146	999	26,929	18,274
Rosebud	2,024	3,368	39,595	36,627
Wibaux	1,484	1,899	24,034	25,563
State totals	133,425	167,060	2,118,717	2,055,120

NOTE: 1930 census figures are preliminary.

GROWTH OF HONEY INDUSTRY

By O. A. Sipple, State Apiarist

PRODUCTION OF MONTANA APIARIES FOR 1909, 1919 AND 1929

Year	Number of Hives	HONEY Pounds Produced	HONEY Value	WAX Pounds Produced	WAX Value
1909	795	135,510	$ 21,802	394	$ 133
1919	1,199	630,608	157,656	7,682	2,614
1929	27,000	3,500,000	225,000	35,000	8,750

The above table indicates the growth of beekeeping in Montana up to and including 1929. Since 1929 a steady and healthy expansion has taken place with beekeepers from other states moving into Montana because of the favorable conditions necessary to producing a good quality honey.

During the past 10 years conditions for beekeeping in Montana have been constantly improving. Before that time the activities of the industry were largely confined to the Yellowstone valley, the Gallatin valley, Bitter Root valley and to a small extent in Flathead and Cascade counties. With the general increase in sweet clover and alfalfa in the state, larger areas became available to beekeeping, and as a result the industry has spread into all parts of the state.

In 1921, the passage of the first legislation concerning apiculture made it mandatory for the newly created State Department of Agriculture to cooperate with the beekeepers of the state. The continued demand on the part of the beekeepers for more assistance made it necessary for the legislature to provide funds to carry on the work. In 1923, the beekeepers had a law passed providing for the registration and payment of fees by all beekeepers. In 1925, the legislature provided an appropriation of $5,000 for the needs of the Apiary Division. While the demands for increased work are constantly growing, further expansion of the departmental activities has been prohibited by lack of funds.

During the past few years, an extensive campaign has been put on to develop the northern part of the state. Up to and including 1929, very little honey has been produced in the northern counties. Since then, however, beekeepers from Oregon and Idaho have been moved into that territory. With the present development of that section it may be safely stated that the northern part of Montana in the course of the next few years will be one of the most important producing sections of the state. With the gradual development laid out along sound and practical lines by the State Department of Agriculture, Montana will be recognized in the very near future as one of the major honey producing states.

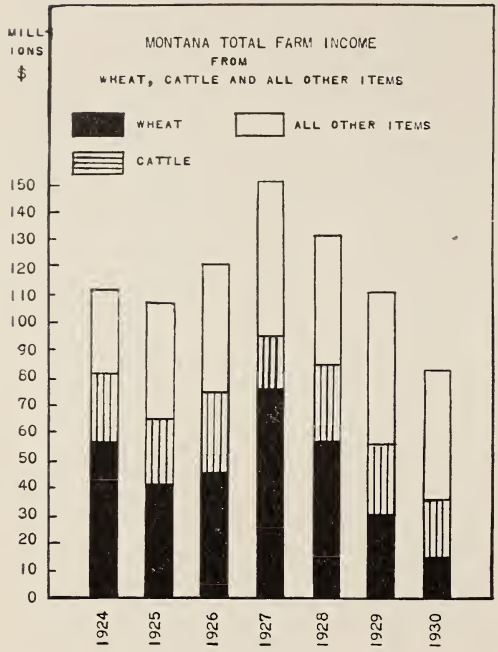
ESTIMATED CLASSIFICATION OF MONTANA LIVESTOCK JANUARY 1, 1870—1931

Year	Milk Cattle	Other Cattle	All Cattle	Horses	Sheep	Swine	Mules
1870	12,400†	24,000†	36,400	5,300†	2,000†	2,600†	500†
1880	11,500†	162,000†	173,500	36,000†	185,000†	10,500†	900†
1883	14,000	590,000	604,000	39,900	405,000	17,000	900
1884	14,200	672,000	686,800	45,900	466,000	17,500	1,000
1885	23,000	615,000	638,000	105,000	625,000	19,000	2,800
1886	25,300	725,700	751,000	120,700	719,000	19,000	8,900
1887	29,000	812,800	841,800	129,000	755,000	20,000	9,200
1888	31,000	934,500	965,500	187,000	1,265,000	22,000	5,500
1889	31,400	962,500	993,900	200,000	1,391,000	23,000	5,300
1890	33,000	981,800	1,014,800	216,000	1,990,000	29,000	2,400
1891	34,000	932,700	966,700	152,000	2,089,000	35,000	1,800
1892	35,700	1,026,000	1,061,700	197,000	2,089,000	35,000	1,200
1893	36,400	1,036,000	1,072,400	207,000	2,528,000	39,000	1,200
1894	36,400	1,057,000	1,093,400	197,000	2,781,000	39,000	900
1895	39,000	1,078,000	1,117,000	198,000	2,809,000	46,000	900
1896	42,000	1,154,000	1,196,000	183,000	3,061,000	52,000	900
1897	43,000	1,177,000	1,220,000	175,000	3,123,000	51,000	900
1898	42,700	1,082,000	1,124,000	171,000	3,248,000	47,000	900
1899	44,000	953,000	997,000	165,000	3,378,000	42,300	1,000
1900	48,500†	926,500†	975,000†	347,000†	6,170,000†	50,000†	2,800†
1901	49,400	960,200	1,009,600	302,000	6,417,000	47,000	3,400
1902	50,000	998,000	1,048,000	275,000	5,081,000	49,000	3,400
1903	52,400	1,048,600	1,101,000	246,600	5,120,000	51,700	3,400
1904	53,900	1,059,000	1,112,900	244,000	5,270,000	54,800	3,400
1905	55,000	1,048,000	1,103,000	236,800	5,639,000	57,600	3,400
1906	61,600	965,000	1,026,600	239,000	5,752,000	59,900	3,600
1907	66,000	916,300	982,300	292,000	5,637,000	62,900	4,000
1908	69,000	879,000	948,000	292,000	5,524,000	66,000	4,000
1909	75,000	905,000	980,000	304,000	5,634,000	68,000	5,000
1910	80,000	842,000	922,000	319,000	5,747,000	75,000	5,000
1911	80,000*	818,000*	898,000	344,000	5,230,000*	124,000	4,500*
1912	91,000	732,000	823,000	350,000*	4,926,000*	145,000	5,000*
1913	95,000	750,000*	845,000	385,000*	4,675,000*	168,000*	5,500*
1914	104,000	826,000*	930,000	440,000*	3,850,000*	187,000*	6,000*
1915	114,000	836,000	950,000	485,000*	3,340,000*	245,000*	6,500*
1916	125,000*	1,035,000*	1,170,000	520,000*	3,020,000*	270,000*	7,000*
1917	140,000*	1,114,000*	1,254,000	580,000*	2,670,000*	260,000*	7,500*
1918	150,000*	1,310,000*	1,460,000	640,000*	2,380,000*	202,000*	8,500*
1919	163,000*	1,447,000*	1,610,000	720,000*	2,530,000*	180,000*	9,000*
1920	178,000	1,192,000	1,370,000	669,000	2,450,000	167,000	9,000
1921	181,000	1,088,000	1,269,000	669,000	2,328,000	160,000	9,000
1922	185,000	1,195,000	1,380,000	650,000	2,561,000	180,000	10,000
1923	192,000	1,168,000	1,360,000	643,000	2,408,000	225,000	10,000
1924	209,000	1,151,000	1,360,000	611,000	2,480,000	292,000	11,000
1925	223,000	1,117,000	1,340,000	596,000	2,579,000	280,000	11,000
1926	225,000	1,055,000	1,280,000	576,000	2,880,000	250,000	11,000
1927	217,000	897,000	1,114,000	547,000	3,053,000	240,000	11,000
1928	212,000	902,000	1,114,000	531,000	3,358,000	288,000	11,000
1929	186,000	966,000	1,152,000	515,000	3,727,000	328,000	11,000
1930	188,000	976,000	1,164,000	469,000	4,200,000	302,000	11,000
1931	188,000	1,011,000	1,199,000	446,000	4,326,000	272,000	11,000

NOTE: Many earlier estimates were made to exact figures. In above table figures have been rounded to even thousands or even hundreds.

†Based upon census data.
*Tentative revisions. All other figures are U. S. Department of Agriculture estimates.

AGRICULTURAL INCOME IN MONTANA 1924-1930



For the past seven years the state-federal crop reporting service has been estimating agricultural income in Montana based upon estimated production and farm value of crops, livestock and livestock products, the amounts of these items reported sold by farmers and the receipts of Montana products at terminal markets, stockyards and railroad shipment data. The series of estimates originally published did not include all the items that could be classified as agricultural products, but served to indicate the yearly variations of agricultural income.

Montana in 1923, was one of the first states to estimate agricultural income. During the past three years similar estimates have been made by the U. S. Bureau of Agricultural Economics for all states including Montana. Differences in methods of computing the income figures as well as differences in the number of items included make the old series used for Montana by the state-federal crop reporting service incomparable with the newer series. The old series has accordingly been discarded and the new one adopted by the state-federal crop reporting service for the period 1924-1929; and the estimates for 1930 made on the new basis.

The accompanying table shows the farm value, gross income and cash income of crops and livestock items and the combined values for the period 1924 to 1930. The term farm value is the total production of crop or livestock each year valued at the estimated December 1, farm prices in case of crops and the average farm prices during the marketing year in case of livestock and livestock products. The gross income is the cash income received from sales of crops and livestock items plus the value of these items such as are consumed on the farm as food for the family or consumed for the further production of farm products. The cash income relates to the value of production that is actually sold off the farm.

ANNUAL VARIATIONS IN INCOME

The annual variations in income from agriculture arise not only from the yearly changes in production but also the yearly fluctuation in prices received by farmers. During the past seven years the cash income from agriculture in Montana has ranged from about $84,000,000 in 1930 to about $151,000,000 in 1927. The five-year (1925-29) average total cash income was $132,297,000.

As between income from crops sold and income from livestock and livestock products sold there is a rather close balance as is indicated by a comparison of the five-year averages. In case of crop income this value was $67,481,000 and for livestock income it was $64,816,000. In years of large crops such as 1924, 1927 and 1928 the income from crops has exceeded the livestock income by rather wide margins. In years of poor crops such as 1929 and 1930, the income from livestock exceeds that from crops by similar margins. The spread between the highest income from livestock and the lowest income in the past seven years

is smaller than in the case of crop income. Livestock income during this period ranged from about $49,000,000 in 1924 to about $72,000,000 in 1929, while crop income ranged from $29,000,000 in 1930 to $97,000,000 in 1927.

MONTANA AGRICULTURAL INCOME ESTIMATES 1924-1930*

Year		Farm Value	Gross Income	Cash Income
1924	Crops	$123,812,000	$ 75,369,000	$ 72,025,000
	Livestock	58,889,000	56,546,000	49,017,000
	Total		$131,915,000	$121,042,000
1925	Crops	106,048,000	61,269,000	57,708,000
	Livestock	71,190,000	70,012,000	60,935,000
	Total		$131,281,000	$118,643,000
1926	Crops	107,020,000	64,503,000	61,453,000
	Livestock	71,910,000	76,734,000	67,854,000
	Total		$141,237,000	$129,307,000
1927	Crops	155,134,000	99,528,000	96,847,000
	Livestock	68,288,000	62,981,000	53,864,000
	Total		$162,509,000	$150,711,000
1928	Crops	123,766,000	76,972,000	74,130,000
	Livestock	82,338,000	77,477,000	68,384,000
	Total		$154,449,000	$142,514,000
1929	Crops	97,599,000	50,935,000	47,269,000
	Livestock	85,591,000	82,773,000	73,042,000
	Total		$133,708,000	$119,695,000
1930	Crops	64,048,000	32,044,000	29,293,000
	Livestock	65,882,000	62,259,000	54,393,000
	Total		$ 94,303,000	$ 83,686,000

*Revised to include all crops and farm products. Farm value is the total evaluation of production. Gross Income includes income from crops or livestock sold for cash as well as value of items consumed on farm where grown by family or consumed for further production of farm products. Cash Income relates to value of production that is actually sold off the farm.

DISTRIBUTION OF INCOME BY ITEMS

Distribution of cash income by principal items is shown in the following table for the period 1924-1930:

DISTRIBUTION OF CASH INCOME AMONG SELECTED ITEMS

(000 Dollars Omitted)

Crop Items	1924	1925	1926	1927	1928	1929	1930
Wheat	54,882	40,329	45,829	75,932	56,446	30,715	13,800
Oats	1,714	1,458	1,763	2,832	1,971	960	700
Flax	4,480	2,243	1,155	2,961	2,888	2,474	1,871
Hay	2,507	2,812	2,649	3,152	2,217	3,060	3,107
Beans	712	1,041	882	1,497	1,893	2,165	1,535
Potatoes	1,341	3,697	2,268	2,507	1,511	1,150	836
Sugar beets	2,684	1,960	2,814	2,996	1,897	2,895	4,205
Livestock Items							
Cattle and calves	17,425	22,966	27,502	20,065	27,207	25,287	18,871
Hogs	4,167	7,024	6,359	4,059	4,574	6,061	4,885
Sheep and lambs	7,694	8,240	9,872	7,856	9,626	13,781	9,816
Wool	7,614	8,669	8,628	7,975	10,118	9,195	6,896
Eggs	2,397	2,800	2,843	2,250	3,128	3,308	3,350
Milk	7,735	9,120	10,108	9,612	11,160	12,812	10,177

In this table it is seen that wheat income is the most unstable item of income ranging from $14,000,000 in 1930 to $76,000,000 in 1927. The variations in wheat income are responsible for most of the variations in total agricultural income as is illustrated by the graph showing the annual income from wheat, cattle and all other income items. In this graph the variations in wheat income parallel those of income from all sources while the income from cattle is relatively steady, as is also the income from all other items combined excluding cattle and wheat.

1930 AGRICULTURAL INCOME

Montana's agricultural income in 1930 fell well under that of 1929 as well as the average income for the preceding five years. It was furthermore the lowest agricultural income for the period of income estimates and probably the lowest since the war. The shrinkage of income in 1930 was accentuated by the curtailment of crop production by reason of the 1930 drought, although 1930 crop prices were in many cases the lowest of a decade or more.

Needless to say the year 1930 was not a typical year for either crop production or farm prices in Montana, and might easily be taken to represent the poorest showing that agricultural income might make with respect to both yields and prices in Montana.

In the table of itemized income from all agricultural sources in both 1929 and 1930, it will be noted that the total crop cash income was but $29,000,000 compared with $47,000,000 in 1929 and the five-year average of $67,000,000. Livestock income in 1930 held up much better than that from crops, the total being about $54,000,000 compared with $72,000,000 in 1929 and the five-year average of $65,000,000. The total agricultural income in 1930 was $84,000,000 compared with $119,000,000 in 1929 and the five-year average of $132,000,000.

Among the sources of crop income wheat fell down badly in 1930 with a cash return of but $14,000,000 compared with $31,000,000 in 1929 and the high record of $76,000,000 in 1927.

Among the sources of livestock income sheep and lamb sales and wool sales show the biggest declines. This decline occurred in spite of the largest marketings of sheep, and largest wool clip in many years. Prices, however, were the lowest for sheep and lambs since 1915, and the lowest for wool since 1921.

MONTANA AGRICULTURAL INCOME ESTIMATES—FARM VALUE, GROSS INCOME AND CASH INCOME FROM FARM PRODUCTION BY COMMODITIES, 1929-1930

(In Thousands of Dollars)

Item	1929 Farm Value	1929 Gross Income	1929 Cash Income	1930 Farm Value	1930 Gross Income	1930 Cash Income
CROPS						
Corn	3,034	79	77	2,146	70	68
Wheat	38,741	30,861	30,715	16,332	13,882	13,800
Oats	4,803	960	960	2,854	700	700
Barley	2,731	546	546	1,529	355	355
Rye	879	330	330	282	95	95
Flaxseed	3,074	2,474	2,474	2,327	1,871	1,871
Emmer and speltz	69	.....	.....	50	.....	.....
Hay	30,564	3,060	3,060	25,893	3,107	3,107
Clover seed	58	15	15	39	12	12
Alfalfa seed	828	804	804	867	847	847
Dry edible beans	2,376	2,176	2,165	1,690	1,546	1,535
Potatoes	3,366	2,580	1,150	2,424	1,857	836
Truck crops	549	549	439	439	439	439
Apples	546	520	445	492	480	410
Plums, etc.	12	12	10	10	9	8
Cherries	44	44	34	31	31	21
Strawberries	29	29	27	15	15	13
Small fruits	53	53	51	40	40	38
Sugar beets	2,895	2,895	2,895	4,205	4,205	4,205
Forest products	966	960	512	900	900	400
Farm gardens	1,422	1,422	.....	950	950	.....
Nursery products	35	35	35	33	33	33
Greenhouse products	525	525	525	500	500	500
Total	97,599	50,935	47,269	64,048	32,044	29,293
LIVESTOCK AND LIVESTOCK PRODUCTS						
Cattle and calves	26,946	26,069	25,287	21,366	19,530	18,871
Hogs	7,485	8,054	6,061	6,331	6,710	4,885
Sheep and lambs	16,184	13,906	13,781	10,630	9,943	9,816
Horses	1,748	1,040	1,040	1,400	650	650
Mules	108	40	40	85	20	20
Chickens	1,952	1,948	840	1,562	1,555	1,555
Eggs	5,108	4,950	3,308	4,086	3,936	2,350
Milk	16,672	16,146	12,812	13,338	12,831	10,177
Wool	9,195	9,195	9,195	6,896	6,896	6,896
Honey	190	190	176	185	185	170
Beeswax	3	3	3	3	3	3
Total	85,591	82,773	72,426	65,882	62,259	54,393
GRAND TOTAL		133,708	119,695		94,303	83,686

FORECASTING MONTANA WHEAT YIELDS FROM THE WEATHER

By JAY G. DIAMOND, Senior Agricultural Statistician

Farmers sow similar seed in similar amounts on similar soils year after year and yet the yields from such seeding vary greatly from season to season. What causes these variations?

It is common knowledge that weather is responsible for a very large part of yield variations in case of most crops. Furthermore, the weather causes precede the effects on yields and in some cases by relatively long spaces of time. Is it possible then to use the weather preceding and during the crop season as a means of forecasting crop yields? The answer is affirmative, but is qualified by the consideration that although much information is available concerning weather and yield relationships, the practical use of forecasting formulae derived from such studies is still in the experimental stage. Weather conditions can be used to explain a large part of the yield variations and when employed together with other systems of crop forecasting have been found to be of considerable help. However, the prediction of yields from a mathematical formula is still to be tested by years of use and development before it will supersede older methods of judgment of farmers themselves as to yield prospects.

The agricultural experimental stations over a long period of time have amassed a wealth of information on the relationship of weather factors to crop yields. In recent years the economist and the statistician have been combing this material with the tools of statistical method and analysis in the hope of deriving from this data a short cut in the problem of yield forecasting. Despite many handicaps that have beset the problem when transferred from the laboratory of the experiment stations to the wheat fields themselves, much progress has been made in the practical application of the laboratory findings.

WEATHER AND YIELD RELATIONSHIPS COMPLEX

The effects of weather on yields are quite complex. Some of them are at variance to what would be expected. In this discussion it is interesting to consider first some of the relationships between weather and wheat yields that have been developed under controlled conditions of the experiment stations. An excellent treatise on this subject was published a few years ago by the food Institute of Research of Stanford University. A skeleton outline of those conclusions, modified somewhat to apply to Montana, is presented as an introduction to the problem of forecasting Montana wheat yields.

Light, heat, and moisture factors are the principal climatic causes of plant growth and development. Within certain limits, or at certain periods in plant growth or in their combinations they probably determine an even larger proportions of yield variations than have as yet been associated with them. The problem, obviously, is one of day to day weather as related to day to day plant development.

The light factor, while essential to plant development, is rarely a limiting factor in green fields. In other words, the seasonal variations in the amount of sunshine is not in itself a yield factor. The length of days and length of summer causes differences in yields as between localities but not for yields in the same locality. Agronomists have found that the wheat plant is not much influenced by light periodicity.

The heat factor has definite limits within which plant life takes place. Most crops cease to grow below 43 degree F. Beyond certain points excessive heat means plant death. Day to day changes in the heat factor are important; crops grow faster on warm days, more slowly or not at all on cold days. The heat of the soil at germination time tends to determine the germination of seed and early start of wheat plants.

The moisture factor is much less important as relates to the actual amount of rainfall at any one time than as relating to the amount that remains in the soil for plant use. Plants absorb moisture through their roots and transpire it through their leaves. There must be a balance between these two processes

and it is this balance that is important. The optimum moisture condition is one in which the moisture in the soil is neither too little nor too much. Too much rainfall leaches out plant food (nitrates) and promotes weed growth. The moisture factor is interlaced with other weather factors. Humidity, temperature and winds may disturb the moisture balance of wheat plants.

PLANT REACTIONS TO WEATHER

Weather factors that are favorable at one stage of plant growth may be unfavorable at another. The weather factors that produce the dry matter in plants are not the same as those required for reproductive growth or seed production. Wheat crops are particularly susceptible to injury during the flowering and seed formation periods. In Montana three critical periods might be given as: (1) Period of germination and emergence. (2) Period of tillering or shooting. (3) Period of flowering and early filling.

In this first period delayed germination or low temperatures may result in killed sprouts, while favorable germination will give a strong seedling. The size of the first leaf of the spring wheat plant tends to determine the size of the plant itself.

In the second period, while the wheat plant shows relatively little response to weather conditions between first leaf and heading as a general rule, in Montana lack of moisture at tillering time may reduce the amount of stooling. Cool moist weather at this period tends to lengthen the interval between emergence and heading and increase the yield.

In the third period, cool weather and plenty of moisture give optimum results while high temperatures and dry weather, especially if accompanied by high winds, give minimum results. Moisture is usually needed about 10 days before heading, but heading itself is largely dependent upon temperature, being advanced by high temperatures and retarded by cool weather. Premature heading in Montana is usually accompanied by dry weather as well as hot weather. There is an increase in the rate of transpiration of moisture at the time of flowering which usually makes the first half of July a critical period in Montana for temperature and wind movement. Hot wind damage has claimed some good crop prospects in a short period of time when conditions up to the period of hot winds have shown other weather factors that have been favorable. In the ripening period the length of the life of the wheat plant, or the longer the period of ripening determines the storage of starch and to this extent the yield. The amount of injury at flowering time largely determines the period of ripening, although to some extent later conditions are a factor.

WEATHER INDICATORS OF MONTANA SPRING WHEAT YIELDS

The pioneer work in spring wheat yield forecasts from weather data was done by P. Patton of the State Agricultural College, in 1926. Mr. Patton selected several weather indicators which gave him a high correlation with spring wheat yields in north central Montana. Using the factor of afternoon humidity, he was able to explain 89.1 per cent of the variations in yields in that area by variations in this weather factor. Later correlations by M. A. Bell at the Havre experiment station, accounted for better than 90 per cent of the yield variations in changes in combinations of causative weather factors.

In 1929 the state-federal crop reporting service began testing similar formulae as applied to state weather conditions and state average yields of winter wheat and spring wheat. Quite similar results were obtained for the state as a whole as those found by Mr. Patton and Mr. Bell in north-central Montana. During the past year, R. P. Sharples, agricultural agent of the crop reporting service, by arranging weather data for the various crop districts to correspond with the relative importance of spring wheat acreage in those districts, uncovered some significant weather and yield relationships for the state as a whole. The period of time used in this study covered the years from 1913 to 1930, and mathematical relationships between the weather and spring wheat yields were worked out for four different weather factors beginning with the fall moisture of the preceding year and ending with August 1, of the crop season. A total of 21

different combinations of these four weather influences were studied, 12 of which may be classed as significant.

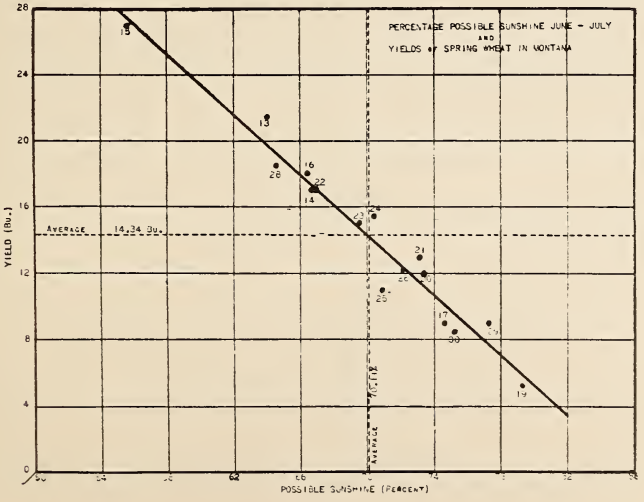
While the period during which some of the weather influences on crop yields was found to extend back about 10 months prior to harvest time, it was not until August 1, that forecast formulae sufficiently accurate for forecasting were possible. This undoubtedly is due to the fact that July weather in itself is highly related to spring wheat yields. However, the earlier formulae have the value of indicating the trend of the weather influences up to July 1, and can be used to indicate the probable yields on July 1 on the basis of the assumption that July weather will continue the trend observed up to that time. There is some statistical basis for such assumption as indicated by the fact that in seasons where weather conditions up to July 1 have been optimum, July weather most of the time has been without serious crop damage. Similarly in seasons where conditions have been reversed, July weather has shown the tendency to be unfavorable or not sufficiently favorable to offset the adverse nature of the preceding weather conditions.

In this article only the more important formulae derived for August 1 forecasts will be presented. The August 1 formulae, when applied to the yields of the past 18 years, have shown a much better relationship with the actual yields of those years than have the other methods of forecast. A somewhat higher precision is also shown for the July formulae.

One consideration in the selection of the weather data was that of its availability at the time of forecast, preference being given to those weather factors which could be assembled more readily. In this selection the single weather factor in the August forecast that proved the most satisfactory was the average percentage of possible sunshine reported at seven weather bureau observation points in and surrounding Montana during June and July. It is curious to note that in this selection we have a weather factor which in itself has little if any significance with yield factors, but is a valuable index of moisture and temperature factors which are important causatives.

The weather factor on August 1, which determines the greatest percentage of yield variations, is July average maxima temperature as compiled from 43 weather observation points in Montana. This data, however, is not as readily available as is the sunshine data. A third weather factor on August is that of the number of days in July at 43 designated observation points in the state where the maxima temperature reached or exceeded 90 degrees. A fourth factor is the total precipitation of the pre-season fall months (Sptember 1 to November 30) plus the amount of May 1 to July 31 as recorded at 57 observation points in Montana.

THE SUNSHINE FORECAST FORMULA



The sunshine forecast formula covers the period 1913 to 1930, omitting two years 1918 and 1927, and gives a correlation coefficient of .978 with an error of estimate of .08. This means that this weather factor in the period studied explains 95.6 per cent of the spring wheat yield variations. The forecast formula in which X_1 equals the predicted yield and X_2 equals the average percentage of possible sunshine in June and July is as follows:

$$X_1 = 77.58 - 902\ X_2$$

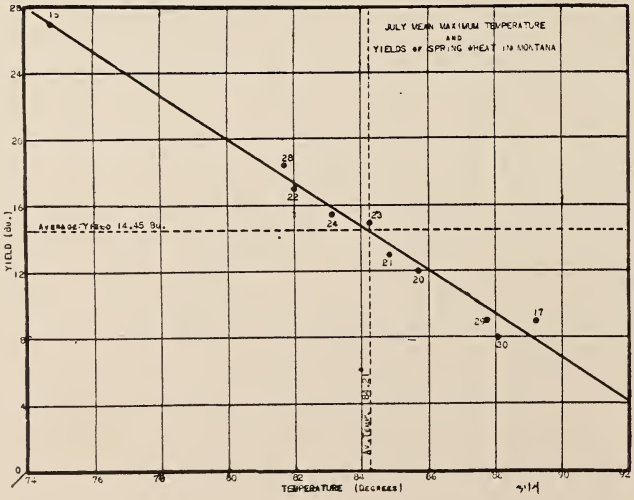
Applied to the past years and compared with the actual yields of those years the formula gives the following predicted values of X_1:

Year	Actual Yield (bushels)	Predicted Yield (bushels)	Difference (bushels)
1913	21.5	19.8	1.7
1914	17.0	17.3	0.3
1915	27.0	27.4	0.4
1916	18.0	17.6	0.4
1917	9.0	10.1	1.1
1919	5.2	6.0	0.8
1920	12.0	11.2	0.8
1921	13.0	11.5	1.5
1922	17.0	17.1	0.1
1923	15.0	14.7	0.3
1924	15.0	14.0	1.5
1925	11.0	13.5	2.5
1926	12.2	12.5	0.3
1928	18.5	19.3	0.8
1929	9.0	7.8	1.2
1930	9.6	8.5	1.1

Graph 1 shows the sunshine data plotted against the yield data and the regression line or line of average relationship as fitted mathematically. Forecasted yield can be read from this line where it intercepts the sunshine data as read from the base line.

THE MAXIMA TEMPERATURE FORECAST FORMULA

The July mean maxima temperature formula expresses the relationship between the average daily maxima temperatures in Montana during July and the yield of spring wheat. The temperature data does not in itself cause all the variations it accounts for but by reason of the fact that it, like the sunshine data, reflects other weather factors such as moisture supply, humidity and evaporation becomes an index of these factors. The maxima temperature data showing the greatest correlation covers 10 years in the period 1913 to 1930, the years omitted being 1913, 1914, 1916, 1918, 1919, 1925, 1926, and 1927. For the years correlated in the formula the coefficient of relationship was .992 with an error of estimate of .05. This formula accounts for 98.4 per cent of all the varia-



tions in spring wheat yields in these years. The forecast formula in which X_1 equals the predicted yield and X_2 the temperature factor is:

$$X_1 = 126.45 - 1.33\ X_2.$$

Applied to past years and predicted values compared with actual yields in those years the formula shows the following results:

Year	Actual Yield (bushels)	Predicted Yield (bushels)	Difference (bushels)
1915	27.0	27.0	0.0
1917	9.0	7.7	1.4
1920	12.0	12.3	0.3
1921	13.0	13.5	0.5
1922	17.0	17.4	0.4
1923	15.0	14.3	0.7
1924	15.5	15.8	0.3
1928	18.5	17.7	0.8
1929	9.0	9.7	0.7
1930	8.5	9.1	0.6

Graph 2 shows the maximum temperature data plotted against the yield data with the mathematically fitted line of average relationship.

THE HOT WIND FORECAST FORMULA

The number of days in July when maxima temperatures exceed 90 degrees is the best measure readily available of hot wind damage from year to year. Seven years in the past 18 were selected as showing significant relationship between this weather factor and spring wheat yields. For these years a correlation of .945 with an error of estimate of .11 was found. The hot wind index explains 89.3 per cent of the variations in yields in these years. The forecast formula in which X_1 equals the predicted yield and X_2 equals the average number of hot days in July is as follows:

$$X_1 = 25.63 - .964\ X_2.$$

Comparison of predicted yields with actual yields for the years correlated shows the following:

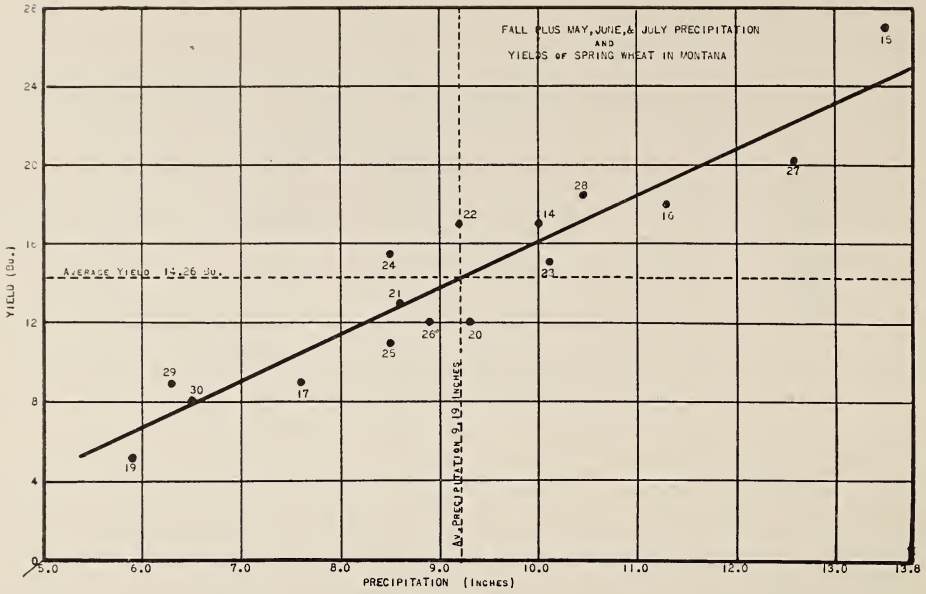
Year	Actual Yield (bushels)	Predicted Yield (bushels)	Difference (bushels)
1913	21.5	20.8	0.7
1916	18.0	19.1	1.1
1921	13.0	11.7	1.3
1922	17.0	16.3	0.7
1927	20.2	20.2	0.0
1929	9.0	9.9	0.9
1930	8.5	8.9	0.4

THE PRECIPITATION FORECAST FORMULA

The precipitation data covers the amount of precipitation received in the preceding fall months of September to November inclusive (an index of the sub-soil moisture in Montana) as well as the spring moisture accruing between May 1 and July 31. The full 18-year period shows a correlation of .896, but eliminating the years 1913 and 1918 raises the correlation to .938, which means that 88.0 per cent of the yield variations in this period are explained by the variations in precipitation. With X_1 as the predicted yield and X_2 as rainfall data the formula for this factor is: $X_1 = -7.38$ plus $2.355\ X_2$.

Applying this formula to past years the actual yield and predicted yield from the precipitation formula were as follows:

Year	Actual Yield (bushels)	Predicted Yield (bushels)	Difference (bushels)
1914	17.0	16.2	0.8
1915	27.0	24.5	2.5
1916	18.0	19.2	1.2
1917	9.0	10.6	1.6
1919	5.2	6.6	1.4
1920	12.0	14.5	2.5
1921	13.0	13.0	0.0
1922	17.0	14.4	2.6
1923	15.0	16.4	1.4
1924	15.5	12.6	2.9
1925	11.0	12.5	1.5
1926	12.2	13.7	1.5
1927	20.2	22.3	2.1
1928	18.5	17.2	1.3
1929	9.0	7.0	2.0
1930	8.5	7.4	1.1



It will be noted in the precipitation formula that not only is the correlation lower than for the other weather factors but the differences between the predicted yields and the actual yields are wider. This is to be expected since as was pointed out in our general consideration of the weather and yield relationships, it is not the total amount of precipitation but the amount of moisture available in the soil for plant needs that determines the yield. So far as the total rainfall is indicative of this supply we may expect correlation, but many factors not only those of the time of rainfall but other weather factors themselves which disturb the soil supply of moisture arise to make the total precipitation data a faulty index of the amount of such moisture that is available for plant uses.

In other words, precipitation, which is perhaps the greatest single factor in determining wheat yields in Montana, is not a good index of yields by itself. For this reason we are justified in combining precipitation with other weather factors.

We have seen that for some years the percentage of possible sunshine gives very close approximations to the actual yields; in others the July mean maxima temperature, and in others the number of days with July maxima above 90 degrees F. Consequently, one or more of these factors might be combined with precipitation to give a better forecasting formula for all years than possible with any one single factor.

One of such combinations is that of the percentage of possible sunshine and precipitation. In this set-up we have two factors inter-acting on each other as well as on spring wheat yields. In place of a simple correlation we have a multiple correlation. In this relationship, a multiple correlation coefficient of .967 with an error of estimate of .13 explains 93.5 per cent of the variations in spring wheat yields. The forecasting formula is as follows:

$$X_1 = 38.00 \text{ plus } 1.296\ X_2 - 0.504\ X_3.$$

In the above equation X_1 is the predicted yield; X_2 the precipitation of fall months plus growing season, and X_3 the average percentage of possible sunshine in June and July. The predicted yields obtained from this formula compared with the actual yields of the past 18 years were as follows:

Year	Actual Yield (bushels)	Predicted Yield (bushels)	Difference (bushels)
1913	21.5	18.4	3.1
1914	17.0	17.3	0.3
1915	27.0	27.5	0.5
1916	18.0	19.1	1.1
1917	9.0	10.2	1.2
1918	12.5	13.9	1.4
1919	5.2	5.7	0.5
1920	12.0	13.0	1.0
1921	13.0	12.3	0.7
1922	17.0	16.2	0.8
1923	15.0	16.0	1.0
1924	15.5	13.5	2.0
1925	11.0	13.2	2.2
1926	12.2	13.2	1.0
1927	20.2	18.7	1.5
1928	18.5	19.0	0.5
1929	9.0	6.9	2.1
1930	8.5	8.1	0.4
1913-22 Average	15.22	15.36	0.14
1921-30 Average	13.99	13.71	0.28
1913-30 Average	26.21	26.22	0.01

SUMMARY

There is still much to be desired in the original material from which weather and yield correlations are made. The periods of weather correlated should be broken up into periods to correspond with the critical periods of plant development. This cannot be done satisfactorily because the critical periods of wheat plant development in Montana are shifting from season to season, and past crop records did not observe and record such phenological data as average dates of emergence, heading, blossoming and harvest. For the past two seasons, since the state-federal crop reporting service has been studying the possibilities of weather-yield forecasts, surveys have been made that have been designed to record such data. For the past years it is hoped that some substitutes may be developed for the lacking phenological data such as frost data in the spring months and the daily rise in temperatures during the early part of the growing season. This, together with crop comments and other history of past years, may make possible the construction of index numbers that will classify the seasons somewhat as to types. It is possible that in years of delayed or advanced crop development, critical periods may have been shifted enough to encounter weather effects that are not disclosed in the data as it is now being used. The interest in the weather and crop relationships furthermore does not center so much on an August 1 forecast of yield, which already is capable of fairly close estimates by older methods, but in earlier forecasts which are unsatisfactory as obtained from the older methods.

Weather formula forecasts seem to offer some hope that ultimately the first forecasts of yields will be much closer to final harvest than they are now. Perhaps such forecasts may ultimately involve some measure of long distance weather forecasting before they can fully meet the requirements of the problem. In any event, they represent the spirit of an age that is hungry to wrest from nature her closest guarded secrets. They point to that happy time when possibly the farmer who has long been the gambler with heat and freeze, flood and drouth, insect pest and plant disease, may look into the future before he plants and thus sidestep a large part of this toll of his yields.

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